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ABSTRACT

This report presents results of a study that investigated the views and concerns about computer and adaptive computer technologies of 156 Canadian postsecondary disability providers. Findings indicate: (1) two-thirds of disability service providers are women and have an average of 9 to 10 years of experience providing disability related service to students; (2) participants admitted to not being very knowledgeable about computer technologies used by students with disabilities, with French speaking disability service providers rating themselves as less knowledgeable than their English speaking counterparts; (3) junior/community colleges had substantially lower overall enrollment than universities, although they had similar numbers of students with disabilities registered to receive disability related services; (4) in general, computer related services constituted a moderately important priority within the full range of services

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offered to students with disabilities and most institutions had some adaptive technologies for these students on campus; and (5) participants indicated that computer related needs of students with disabilities are moderately well met at their institutions. The report discusses factors deemed important in ensuring that instructions are technologically welcoming to students with disabilities and that recommendations are easy to follow for individuals responsible for providing services to students with disabilities. A CD-ROM is included. (Contains 113 references.) (CR)

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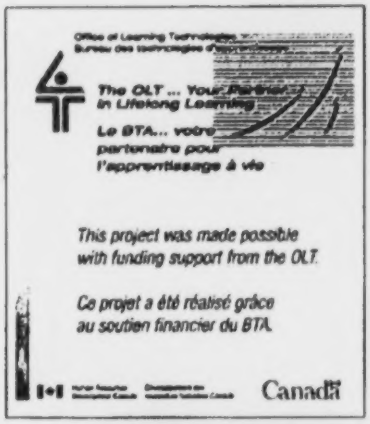
Computer and Information Technologies: Resources for the Postsecondary Education Of Students With Disabilities

Final Report to the Office of Learning Technologies
Fall 2001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Our project partners: the Canadian Association of Disability Service Providers in Post-Secondary Education (CADSPPE), the Service d'aide à l'intégration des élèves (SAIDE - Cégep du Vieux Montréal), le Services aux étudiants handicapés du Cégep de Sainte-Foy, the Association québécoise des étudiants ayant des incapacités au postsecondaire (AQEIPS), and the National Educational Association of Disabled Students (NEADS) not only were vocal supporters of our work, but provided expertise and feedback during all phases of our research. They also provided us with numerous opportunities to publicize our research to their members. Merci and thanks to each of you.

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Computer and Information Technologies: Resources for the Postsecondary Education Of Students With Disabilities

Final Report to the Office of Learning Technologies Fall 2001

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EXECUTIVE SUMMARY

Abstract

Results of an empirical study investigating the views and concerns about computer and adaptive computer technologies of postsecondary disability service providers are presented. The study was carried out in both French and English in the spring of 2000. Based on structured interviews with 156 Canadians who provide disability related services to students, the responses represent an 80% participation rate. Key findings in the following areas are highlighted: characteristics of postsecondary disability service providers; presence of students with disabilities on campus, availability and accessibility of campus computers to students with disabilities, important factors in meeting the computer related needs of students with disabilities, and the presence and needs of postsecondary faculty and staff with disabilities. An extensive listing of useful resources is provided and recommendations are made to guide decision making to ensure that Canadian colleges and universities are technologically welcoming of the whole campus community.

Objectives

Participation in the knowledge based economy of today means that Canadians must be comfortable using new computer and information technologies. This is true not only in employment, but everywhere in society. Postsecondary education is meeting this need by providing students opportunities to learn and use computer and information technologies. Examples include virtual classrooms, online courses, off campus library access, and the increasing availability of sophisticated computer labs on campus. The challenge is to ensure that these technologies are both physically and technologically accessible to learners with various impairments. Unless this requirement is met, people with disabilities face a real danger of being left behind.

The goal of our research is to provide empirically based information to assist in decision making. Our intent is to ensure that new learning and computer technologies and policies about their availability and accessibility, both on and off campus, reflect the needs and concerns of a variety of individuals:

- Members of the postsecondary educational community with disabilities
- Professors who teach students with disabilities
- Campus based disability service providers and professionals who make technological, adaptive, and other supports available on campus

This study is a companion to a previous empirical investigation where our focus was on the needs and concerns of over 800 Canadian college and university students with disabilities. In this companion work, we shift focus to the perspective of the professionals who provide disability related supports to people with disabilities on campus. Specific objectives for the present study were:

- Evaluate campus based disability service providers' computer technology related needs and concerns; find out what these are and propose solutions to problems so that people with disabilities are better served in postsecondary education
- Explore institutional concerns: evaluate how postsecondary institutions' computer and information technologies could better accommodate the learning needs of students with disabilities
- Assess the situation of faculty and staff with disabilities: explore how their computer and adaptive technology needs are met in postsecondary institutions

Methodology

In the spring of 2000 a bilingual structured interview consisting of 38 sets of questions was developed and administered by telephone to 156 postsecondary personnel who provide services to postsecondary students with disabilities. Participants were recruited by contacting all member organizations of the Association of Community Colleges of Canada (ACCC) and the Association of Universities and Colleges of Canada (AUCC). The 156 participants represent 146 postsecondary educational institutions: 91 junior/community colleges and 55 universities, including postsecondary distance education. Seventy-four percent of respondents represented anglophone institutions, 25% represented francophone institutions, and 1% represented bilingual institutions. The overall participation rate was 80%, suggesting that the findings are truly representative of the Canadian postsecondary environment. Interviews lasted between 5 and 25 minutes. The majority of questions used a 6-point Likert scale with response options ranging from "strongly disagree" to "strongly agree."

Findings And Conclusions

Who are they? Characteristics of individuals who provide disability related services to students with disabilities. Two thirds of participating disability service providers were women. They had, on average, between 9 and 10 years of experience providing disability related services to students. Despite this, they admitted to not being very knowledgeable about computer technologies used by students with disabilities. French speaking disability service providers rated themselves as less knowledgeable than did their English speaking counterparts. There were no differences in self rated expertise between college and university based individuals, nor between men and women.

Expertise in the use and deployment of computer and adaptive computer technologies for students with disabilities is rapidly becoming a necessity in postsecondary education. This suggests that money and time need to be invested in professional development opportunities, especially in the francophone community.

Enrollment. We estimate that there are well over 100,000 students with disabilities currently enrolled in Canadian postsecondary education. However, only between 1/4 and 1/2 of them are registered to receive disability related services.

Junior/community colleges generally had substantially lower overall enrollments than universities, although they had similar numbers of students with disabilities registered to receive disability related services. The average was 211 in junior/community colleges and 217 in universities. When it came to the proportion of the student body that was registered to receive disability related services, we found large differences between institutions. Proportions ranged from close to 0% to more than 35%. Although the average was between 2-1/2% and 3-1/2%, in most institutions the percentage was under 1%. In general, the percentage of students with disabilities was higher in junior/community colleges than in universities.

Our results also show that there is a substantially smaller proportion of these students in the mainly French speaking Québec postsecondary education system than in comparable institutions elsewhere. Our analyses show that most of the difference is due to provincial policies and practices, with a smaller but independent role for language.

Actual situation of computers on Canadian campuses. In general, computer related services constituted a moderately important priority within the full range of services offered to students with disabilities. Most institutions had some adaptive technologies for these students on campus (e.g., software that reads what is on the screen, adapted mice). Colleges were less likely to have equipment than universities. Less than 1/4 of institutions have a multidisciplinary advisory/steering committee that deals with the accessibility of computer technologies. Committees generally had individuals who provide disability related services to students, students with disabilities, faculty, and administration representatives. Only 1/4 of committees had computer services staff representation.

If information technology continues to be an important priority, then having these types of committees with the necessary mix of expertise is vital to ensure that specific disability related concerns can be addressed. This would also provide a more prominent role for computer adaptations for students with disabilities. Finally, such committees would go a long way toward ensuring that disability support professionals are consulted when campus wide computer infrastructure decisions are made.

Participants indicated that computer related needs of students with disabilities are moderately well met at their institutions. This was true for institutions with and without available adaptive computer technologies for their students. Institutions with no equipment were primarily smaller colleges with few students with disabilities. They were able to meet the computer related needs of their students with disabilities for three reasons: (1) minimal integration of computer and learning technologies in the curriculum, (2) the ability of some students to use equipment in the college's general use computer labs, and (3) extensive human assistance on campus supplemented by students' own equipment for off campus use.

With growing enrollment figures and rapid deployment of computer technologies across the curriculum, we expect increased demand for computer and adaptive computer technologies for students with disabilities on campus.

Evaluation criteria: Aspects important in meeting the computer related needs of students with disabilities. The following factors were deemed important in ensuring that the institution is technologically welcoming to its students with disabilities.

- Sufficient funding for computer and adaptive computer technologies
- Adequate training opportunities for students from agencies in the community
- Good access to adaptive computer technologies on campus
- Availability of support for adaptive computer technologies on campus
- Accessible computer based teaching materials used by professors
- Accessibility of the internet, online education and the library

Report card: Adequacy of aspects of computer technologies on campus in meeting the needs of students with disabilities. Approximately 1/3 of institutions reported that a provincial/regional centralized computer technology loan program was available to help them meet students' needs. In general, these appeared to work very well, as our participants expressed strong satisfaction with the equipment and responsiveness of these programs.

Participants also felt that their administrations were generally supportive of the computer related concerns of students with disabilities in words, but many suggested that this often failed to translate into dollars. Other strengths included: good hours of access to computers; the extent to which campus based equipment was up-to-date; and the appropriateness of equipment provided by community agencies to students for off campus use.

Problem areas included:

- Inadequate availability of adaptive computer technologies in general use computer labs
- Poor technical support for adapted computer technologies
- Inaccessibility of computer based teaching materials used by faculty
- Lack of awareness of faculty about computer related needs of students with disabilities
- Few opportunities to learn about computer technologies
- No consultation when campus wide computer infrastructure decisions are made
- Inaccessible online courses
- Inadequate training by community agencies for students using adaptive technologies

The implications of not addressing these issues are self-evident.

Faculty and staff with disabilities. There seems to be very little information available to individuals who provide disability related services to students with disabilities about employees with disabilities. Indeed, many participants were unable to even estimate the number of these employees at their institution. When they were able to respond, the most common response was 0.

Considerable confusion existed about who should provide computer related services to employees with disabilities. Approximately 1/4 of respondents indicated that the office for students with disabilities would provide needed computer related services. Of the rest, the most popular response was Human Resources, followed by the employee's department. It was dismaying to find that the next most popular category was that the employee himself or herself was responsible or that the respondent simply did not have any ideas about who does or should provide computer related services to these employees. Clearly, standardized policies in this area will need to be formulated in the near future.

Recommendations For Individuals Responsible For Providing Services To Students With Disabilities

To help assure good access to computer, information and adaptive technologies on postsecondary campuses we make the following recommendations to disability service providers:

- Through ongoing evaluation of the current situation on campus, ensure that the minimal criteria for technology access are met - these are specified in the discussion section of this report
- Make computer and adaptive computer technologies for students with disabilities available on your campus
- Provide off-hours access to computer technologies and arrange to loan computer technologies to students
- Regularly inform students with disabilities about what equipment is available to them on campus
- Educate professors about the importance of ensuring accessibility of computer based materials and techniques used in their courses
- Make training a priority both for students and postsecondary personnel
- Include students with disabilities in all computer, learning, and adaptive computer technology purchase decisions
- Value and make use of the opinions of students with disabilities in decision making
- Make acquisition decisions that reflect the needs of all students with disabilities
- Advocate for discussion of accessibility during faculty training workshops on technology integration in courses

- Become informed and share information on government programs offering technology-based assistance to students with disabilities
- Make internet access for students with disabilities a priority
- Get involved in planning bodies responsible for institution-wide information technology purchases and systems development

It is important to ensure that postsecondary administrators, instructors and other campus based technicians and professionals incorporate accessible and inclusive design principles when planning and implementing learning and computer technologies. These need to be accessible to the whole campus community. Otherwise, postsecondary educational institutions will contribute to widening the digital divide and to disenfranchising individuals with disabilities by denying them opportunities to learn and prosper in the new economy. To help with this process our report provides a listing of useful resources as well as recommendations about what various campus groupings and departments can do to improve access to computer and learning technologies to all members of the campus community.

Contact Information

For additional information and the full report, consult the Adaptech Project web page or contact one of the principal investigators.

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Technologies de l'information et de la communication : Ressources pour l'éducation postsecondaire des étudiants ayant des incapacités

Rapport final remis au Bureau des technologies d'apprentissage Automne 2001

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SOMMAIRE

Résumé

Les résultats d'une étude empirique enquêtant sur les perceptions et préoccupations des répondants locaux quant aux services aux étudiants ayant des incapacités relatifs aux technologies informatiques et technologies informatiques adaptatives sont présentés. L'étude a été menée autant en anglais qu'en français au printemps 2000. Reposant sur des entrevues structurées avec 156 Canadiens qui offrent des services informatiques aux étudiants, le taux de réponse représente 80 % de participation. Les résultats clés sur les sujets suivants sont présentés: caractéristiques des responsables des services aux étudiants ayant des incapacités, présence des étudiants ayant des incapacités sur le campus, disponibilité et accessibilité des ordinateurs du campus aux étudiants ayant des incapacités, facteurs importants dans la réponse aux besoins informatiques des étudiants ayant des incapacités, présence et besoins du corps professoral et du personnel ayant des incapacités. Une liste détaillée de ressources est offerte ainsi que des recommandations afin d'orienter les prises de décisions qui assureront que les collèges et universités canadiens sont «technologiquement» accueillants à travers le campus.

Objectifs

La participation dans l'économie du savoir d'aujourd'hui demande aux Canadiens d'être à l'aise dans l'usage des nouvelles technologies de l'information et de la communication. Ceci est non seulement vrai pour l'emploi, mais aussi dans la société en général. L'éducation postsecondaire répond à ce besoin en offrant l'occasion aux étudiants de se former sur et d'utiliser les technologies d'information et de la communication. Nous pouvons citer comme exemples les classes virtuelles, les cours en ligne, l'accès hors campus à la bibliothèque, et l'accessibilité croissante à des laboratoires informatiques sophistiqués sur le campus. Le défi est de s'assurer que ces technologies sont accessibles autant physiquement que «technologiquement» aux étudiants ayant différentes limitations fonctionnelles. Si cette condition n'est pas satisfaite, les personnes ayant des incapacités feront face à un réel danger d'être mis à l'écart.

Le but de notre recherche est d'offrir de l'information reposant sur des données empiriques qui assisteront les prises de décisions. Nous avons l'intention de garantir que les nouvelles technologies d'apprentissage et informatiques ainsi que les politiques sur leur disponibilité et accessibilité sur le campus et hors campus reflètent les besoins et préoccupations d'une variété d'individus:

- Membres ayant des incapacités de la communauté éducative au postsecondaire
- Professeurs qui enseignent aux étudiants ayant des incapacités
- Responsables des services aux étudiants ayant des incapacités du campus et les professionnels qui mettent à leur disposition sur le campus des supports technologiques, adaptatifs ou autres

Cette étude se veut un complément à notre enquête empirique précédente qui mettait l'accent sur les besoins et préoccupations de plus de 800 collégiens et universitaires canadiens ayant des incapacités. Dans ce présent travail complémentaire, nous nous centrons sur les professionnels qui offrent des services de soutien aux étudiants ayant des incapacités du campus. Les objectifs spécifiques de cette étude sont:

- Évaluer les besoins et les préoccupations des responsables des services aux étudiants ayant des incapacités en matière de technologies informatiques, les découvrir et proposer des solutions afin d'améliorer les services aux personnes ayant des incapacités dans le milieu de l'éducation au postsecondaire
- Explorer les inquiétudes institutionnelles: évaluer comment les technologies de l'information et de la communication de l'établissement postsecondaire pourraient mieux répondre aux besoins d'apprentissage des étudiants ayant des incapacités
- Estimer la situation du corps professoral et du personnel ayant des incapacités: explorer comment les technologies informatiques et les besoins relatifs aux technologies informatiques adaptatives sont satisfaits dans les établissements d'enseignement postsecondaire

Methodologie

Au printemps 2000, nous avons développé un protocole d'entrevue structurée d'un ensemble de 38 questions que nous avons administrés par téléphone à 156 individus du personnel du postsecondaire qui offrent des services aux étudiants ayant des incapacités au niveau postsecondaire. Nous avons recruté les participants en communiquant avec les membres de l'Association des collèges communautaires du Canada (ACCC) et de l'Association des universités et collèges du Canada (AUCC). Les 156 participants représentent 146 établissements d'éducation postsecondaire: 91 collèges juniors/communautaires et 55 universités incluant l'éducation postsecondaire à distance. Soixante-quatorze pour-cent des répondants provenait des établissements anglophones, 25 % des établissements d'enseignement francophones et 1 % des établissements bilingues. Le taux total de participation était de 80 %, ce qui semble suggérer que les résultats soient représentatifs du milieu canadien au postsecondaire. Les entrevues ont duré de 5 à 25 minutes. La majorité des questions demandait l'usage d'une échelle de Likert à 6-points où les réponses varient entre «fortement en désaccord» à «fortement d'accord».

Résultats et conclusions

Qui sont-ils? Caractéristiques des individus offrant des services relatifs aux incapacités aux étudiants ayant des incapacités. Les deux tiers des participants responsables des services aux handicapés étaient des femmes. Ils avaient en moyenne de 9 à 10 ans d'expérience dans l'offre de services liés aux incapacités des étudiants. Malgré cela, ils ont avoué ne pas être connaisseurs en matière de technologies informatiques utilisées par les étudiants ayant des incapacités. Les répondants francophones ont évalué ce niveau de connaissance à la baisse en comparaison à leurs collègues anglophones. Il n'y avait pas de différences dans l'autoévaluation de son expertise entre les collèges et les universités ou entre hommes et femmes.

L'expertise dans l'usage des technologies informatiques et technologies informatiques adaptatives des étudiants ayant des incapacités est rapidement devenue une nécessité dans l'éducation postsecondaire. Ceci semble suggérer que les besoins de financement et de temps doivent être reconnus dans les occasions de développement professionnel, surtout en ce qui concerne la communauté francophone.

Recensement. Nous estimons qu'il y a plus de 100 000 étudiants ayant des incapacités présentement inscrits à un établissement d'enseignement postsecondaire au Canada. Toutefois, que le 1/4 ou la 1/2 d'entre eux sont inscrits pour recevoir des services reliés à leurs incapacités!

Les collèges juniors/communautaires ont généralement moins d'inscriptions globales que les universités, même si le nombre d'étudiants ayant des incapacités inscrits pour recevoir des services reliés à leurs incapacités est similaire. La moyenne était de 211 dans les collèges juniors/ communautaires et 217 dans les universités. En ce qui concerne la proportion d'étudiants inscrits pour recevoir des services, nous obtenons de grandes différences entre les établissements d'enseignement. Les proportions variaient de près de 0 % à plus de 35 %. Même si la moyenne était entre 2-1/2 % et 3-1/2 %, dans la plupart des établissements d'enseignement le pourcentage était sous 1 %. En général, le pourcentage d'étudiants ayant des incapacités était plus élevé pour les collèges juniors/communautaires que pour les universités.

Nos résultats démontrent aussi qu'il y a une proportion substantiellement plus petite de ces étudiants dans le système d'éducation québécois, qui est principalement francophone, si on le compare aux établissements d'enseignement d'ailleurs. Notre analyse révèle que la majorité des différences s'explique par les politiques et pratiques provinciales et par la plus petite, mais indépendante part de la langue.

La situation actuelle des ordinateurs sur les campus canadiens. En général, les services informatiques constituaient une priorité modérément importante dans la gamme de services offerts aux étudiants ayant des incapacités. La plupart des institutions avait quelques technologies informatiques adaptatives pour ses étudiants du campus (p. ex., logiciel qui lit ce qui apparaît à l'écran, souris adaptée). Les collèges avaient moins tendance à avoir des technologies que les universités. Moins du quart des établissements d'enseignement avait un comité aviseur/conseiller multidisciplinaire qui traitait de l'accessibilité des technologies informatiques. Les comités avaient généralement des individus qui offrent des services relatifs à l'incapacité aux étudiants, des étudiants ayant des incapacités, des membres du corps professoral et des représentants de l'administration. Le personnel de l'informatique n'était représenté que sur le 1/4 des comités.

Si les technologies informatiques continuent d'être une priorité majeure, il est alors vital d'avoir ces types de comité ayant une représentation nécessaire pour assurer qu'on discute des préoccupations spécifiques reliées aux incapacités. Ceci concéderait également un rôle prédominant à l'adaptation des ordinateurs pour les étudiants ayant des incapacités. Finalement, ce genre de comité encouragerait la consultation des professionnels de soutien aux incapacités lors de décisions en matière de technologies informatiques sur le campus.

Les participants ont indiqué que les besoins relatifs à l'informatique des étudiants ayant des incapacités sont modérément satisfaits par leur établissement d'enseignement. C'était le cas autant pour les établissements qui avaient des technologies informatiques adaptatives pour leurs étudiants que ceux qui n'en avaient pas. Les établissements qui n'avaient pas d'équipement étaient principalement des plus petits collèges avec peu d'étudiants ayant des incapacités. Ils étaient en mesure de répondre aux besoins relatifs à l'informatique des étudiants ayant des incapacités pour trois raisons: (1) intégration minimale des technologies de l'information et de communication dans le curriculum, (2) la capacité de certains étudiants à utiliser l'équipement dans les laboratoires de technologies à usage général à l'établissement, et (3) une assistance humaine extensive sur le campus complétée par l'équipement informatique des étudiants pour un usage hors campus.

Avec la croissance des taux d'inscriptions et l'utilisation des technologies informatiques dans les curriculums, nous nous attendons à une demande accrue pour des technologies informatiques adaptatives pour les étudiants ayant des incapacités sur le campus.

Critères d'évaluation: aspects importants dans la réponse aux besoins des étudiants ayant des incapacités relatifs à l'informatique. Les facteurs suivants ont été reconnus comme importants pour assurer que l'établissement d'enseignement est «technologiquement» accueillant à ses étudiants ayant des incapacités.

- Financement suffisant pour les technologies informatiques et technologies informatiques adaptatives
- Occasion dans les agences de la communauté de formation adéquate pour les étudiants
- Accès suffisant aux technologies informatiques adaptatives du campus
- Disponibilité de soutien pour les technologies informatiques adaptatives du campus
- Matériel de cours accessible utilisé par les professeurs
- Accessibilité de l'internet, de l'éducation en ligne et de la bibliothèque

Relevé de note: Pertinence des aspects des technologies informatiques du campus dans la réponse aux besoins des étudiants ayant des incapacités. Approximativement, le 1/3 des établissements d'enseignement soulève qu'un programme provincial/régional centralisé de prêt informatique est disponible pour aider à répondre aux besoins des étudiants. En général, ces derniers semblent bien fonctionner puisque nos participants ont indiqué une grande satisfaction avec l'équipement et la réponse de ces programmes.

Les participants ont aussi évalué que, en théorie, leurs cadres soutenaient généralement les impératifs informatiques des étudiants ayant des incapacités, mais qu'en pratique, plusieurs ont suggéré que ces intentions ne se traduisaient pas en dollars. D'autres forces incluent: bonnes heures d'accès aux technologies informatiques, la quantité d'équipement du campus mis à jour, et la convenance de l'équipement fourni par les agences communautaires aux étudiants pour un usage hors campus.

Les problèmes comprennent:

- Le manque de technologies informatiques adaptatives dans les laboratoires informatiques à usage général
- Faible soutien technique relatif aux technologies informatiques adaptatives
- Inaccessibilité du matériel informatique de cours utilisé par le corps professoral
- Faible conscientisation des professeurs aux besoins informatiques des étudiants ayant des incapacités
- Peu d'occasions de formation sur les technologies informatiques
- Pas de consultation lorsque des décisions relatives aux parcs informatiques sont faites
- Inaccessibilité des cours en ligne
- Formation inadéquate des étudiants par les agences communautaires sur les technologies adaptatives

Les implications qu'entraîne la non-réponse à ces problématiques s'expliquent d'elles-mêmes.

Corps professoral et personnel ayant des incapacités. Les individus qui offrent des services relatifs à l'incapacité aux étudiants ayant des incapacités semblent avoir peu d'information sur les employés ayant des incapacités. En effet, plusieurs participants n'étaient pas en mesure d'estimer le nombre de ces employés à leur établissement d'enseignement. S'ils le pouvaient, la réponse la plus commune était 0.

Une confusion considérable existait sur qui devrait offrir des services informatiques aux employés ayant des incapacités. Approximativement, le 1/4 des répondants a indiqué que le bureau des services aux étudiants ayant des incapacités pourrait offrir des services reliés aux besoins informatiques. Parmi d'autres, la réponse la plus populaire était les ressources humaines, suivi du département de l'employé. Il fut déconcertant de trouver que la catégorie suivante était que l'employé lui-même était responsable ou que le répondant ne savait pas qui devait ou devrait offrir des services informatiques à ces employés. Ostensiblement, des politiques standardisées dans ce domaine doivent être formulées aussitôt que possible.

Recommandations pour les individus responsables des services aux étudiants ayant des incapacités

Afin d'assurer l'accès adéquat aux technologies informatiques et adaptatives sur les campus des établissements d'enseignement postsecondaire, nous proposons les recommandations suivantes aux responsables des services:

- Par une évaluation continue de la situation courante, garantir que les exigences minimales quant à l'accès aux technologies soient atteintes. Ces dernières sont présentées dans la discussion de ce rapport
- Rendre accessibles sur le campus les technologies informatiques et les technologies informatiques adaptatives aux étudiants ayant des incapacités
- Offrir un accès aux technologies informatiques dans des temps plus souples et s'organiser pour prêter des technologies informatiques aux étudiants
- Informer sur une base régulière les étudiants ayant des incapacités de l'équipement qui sont à leur disposition sur le campus
- Éduquer les professeurs sur l'importance d'assurer l'accessibilité du matériel informatique de cours et des techniques utilisées dans leurs cours
- Faire de la formation une priorité pour les étudiants et le personnel des établissements d'enseignement postsecondaire
- Inclure les étudiants ayant des incapacités dans toutes les décisions d'achats de technologies informatiques d'apprentissage et adaptatives
- Faire valoir et se servir de l'opinion des étudiants ayant des incapacités dans la prise de décision
- Prendre des décisions qui reflètent les besoins de tous les étudiants ayant des incapacités
- Défendre la cause de l'accessibilité durant les ateliers de formation du corps professoral sur l'intégration des technologies dans les cours
- S'informer et partager l'information sur les programmes gouvernementaux qui offrent de l'assistance technologique aux étudiants ayant des incapacités
- Faire de l'accessibilité de l'internet aux étudiants ayant des incapacités une priorité
- S'engager dans les comités de planification d'achats de technologies et de systèmes de développement pour l'ensemble du campus

Il faut s'assurer que les cadres, les formateurs et autres techniciens ou professionnels du campus incluent des principes de design accessible et inclusif quand vient le temps de planifier et d'implanter des technologies d'apprentissage et informatiques. Ces besoins doivent être satisfaits pour l'ensemble de la communauté du campus. Autrement, les établissements d'enseignement postsecondaire contribueront à l'agrandissement de l'écart et à la marginalization des individus ayant des incapacités en leur enlevant l'occasion d'apprendre et de prospérer dans une nouvelle économie. Afin d'aider à ce processus, notre rapport offre une liste de ressources utiles ainsi que des recommandations sur ce que différents groupes ou départements du campus doivent suivre pour améliorer l'accès aux technologies informatiques et d'apprentissage à l'ensemble des membres de la communauté du campus.

Information pour nous rejoindre

Pour plus d'informations et pour le texte intégral du rapport, consultez la page web du site du Projet Adaptech ou contactez l'un des principaux chercheurs.

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PREAMBLE

Computer and information technologies have the potential to enhance the lives of people with disabilities as well as to deny them equality of access to education, jobs, and community life. Our focus is on evaluating the needs and concerns around computer, information, learning and adaptive technologies in postsecondary education. By obtaining collecting and compiling empirical data in this area, we are well placed to identify and propose solutions to problems and inadequacies. The end-result is that people with disabilities are better served in postsecondary institutions.

The mission of our work is to provide sound empirical data to assist in decision making that ensures that new information technology and related policies, software and hardware reflect the needs and concerns of postsecondary students, faculty, and staff with disabilities; professors who teach students with disabilities; and campus based professionals who provide disability related technology and other supports. We use a variety of dissemination vehicles to ensure that the findings are available to facilitate informed planning and decision making by service providers, administrators, IT professionals, and policy makers, as well as developers and suppliers of general use and adaptive technologies. It is expected that the findings and recommendations will be used in postsecondary education to change policies and practices concerning improving, updating, and rendering accessible existing and anticipated computer, information, learning and adaptive technologies for people with disabilities in the postsecondary educational environment.

In a previous OLT funded investigation (Fichten, Barile, & Asuncion, 1999a) we explored the learning, computer and adaptive computer technologies needs and concerns of over 800 Canadian university and community/junior college students. In the present investigation we describe the methods and findings of a companion investigation to the 1999 student project. This provides information about institutional concerns, staff and faculty with disabilities, and the computer, information and adaptive technologies related needs and concerns of more than 150 campus based individuals who provide disability related services to students.

Specific objectives for the present study were:

- Evaluate campus based disability service providers' technology related needs and concerns: find out what these are and propose solutions to problems so that people with disabilities are better served in postsecondary institutions.
- Explore institutional concerns: evaluate how postsecondary institutions' computer and learning technologies could better accommodate the learning needs of students with disabilities
- Assess the situation of faculty and staff with disabilities: explore how their computer and adaptive technology needs are met in postsecondary institutions

BACKGROUND

Postsecondary Education For People With Disabilities

Postsecondary education for people who have a disability is important for the same reasons as it is for nondisabled people. It helps fulfill personal goals, allows for effective competition in the job market and contributes to independence and financial security. Estimates of the number of North American postsecondary students with some disability have ranged from 5% to 11 % (CADSPPE, 1999; Henderson, 1995, 1999; Horn & Berktold, 1999; Greene & Zimbler, 1989; Disabled Students in Postsecondary Education, 1997). Data from the United States show that students with disabilities who receive adequate services persist in their studies and graduate at similar rates to their nondisabled peers (Horn & Berktold, 1999; Miller, 2001). University and college graduates with and without disabilities have better employment outcomes than people without postsecondary education (e.g., Horn & Berktold, 1999; Government of Canada, 1996). A small investment of time and money today will pay handsome dividends in the long run.

Data on postsecondary students and graduates with disabilities indicate that most want to work (Hubka & Killean, 1996). Thus, postsecondary education is more important for people who have a disability. It has been shown, for example, that although employment figures for university graduates with disabilities is somewhat lower than that of their nondisabled peers (e.g., Horn & Berktold, 1999), once employed, salaries are similar, and their rates of employment are still substantially higher than that of students who did not complete university, who, in turn, did better than those who never went to college (Government of Canada, 1996; Louis Harris & Associates, 1994).

The benefits of online education for students with disabilities have been described extensively (e.g., Shumila & Shumila, 1998). There are data available which suggest that use of computer supports by students with disabilities provided on campus for students with disabilities was related to better academic performance (Shell, Horn, & Severs, 1988). Moreover, people with disabilities who have a high level of computer skill were shown to have more favorable employment outcomes (Pell, Gillies, & Carss, 1997). Clearly, new information and learning technologies used for the purpose of assisting all people through life-long learning must continue to be inclusive of people with disabilities.

Learning And Computer Technologies In Postsecondary Education

The advent of the computer revolution has resulted in rapid changes in both theory and practice in postsecondary education (cf. America's 100 Most Wired Colleges - 1999, 2000; Campus Backbone Connectivity, 1999; EDUCAUSE Online Guide to Evaluating Information Technology on Campus, 2000). Multimedia, on line courses, web based delivery of course materials, virtual communities, and learner rather than teacher centered approaches have resulted in renewed interest in improving postsecondary teaching and learning. Much of the excitement about conceptual and theoretical developments is, at this time, more evident in the literature rather than in practice (cf. The 1998 National Survey of Information Technology in Higher Education, 1998).

It has yet to be proven that computer assisted instruction is superior to traditional delivery of education (cf. Russell, 1997, 1999). What is clear, however, is that in the foreseeable future newly emerging educational media are not only here to stay but will grow rapidly (e.g., Farrell, 1999; Mercier, 1999; Office of Learning Technologies, 1998a, 1998b). Many postsecondary institutions are scrambling to provide the IT infrastructure and training to help the campus community acquire the basic skills needed to function given the new realities (cf. UCLA Graduate School of Education & Information Studies, 1999).

Learning, Computer and Adaptive Computer Technologies For Postsecondary Students With Disabilities

Because the ability to quickly learn and use the new information technologies is a necessity for effective participation in the new North American economy, computer literacy and know-how are part of most postsecondary students' formal education. One need only look at North American colleges and universities to see this trend in action. These campuses are becoming increasingly "wired" and the technology is appearing in all aspects of academic life (cf. Bernstein, Caplan, Glover, 2001; EDUCAUSE Online Guide to Evaluating Information Technology on Campus, 2001). The integration of online courses and computer-mediated and web-based learning into curricula are high priorities at most universities and community/junior colleges. In parallel with this trend is evolution in the accessibility and affordability of both popularly used and adaptive computer technologies (cf. Adobe, 2001; Apple, 2001; Henter-Joyce, 2001; IBM, 2001; Microsoft, 2001). If these technologies interface smoothly then the two trends have the potential to level the playing field. In particular, this ideal situation will provide students with disabilities access to the same skill sets and opportunities as their nondisabled peers. This outcome is, of course, contingent on individuals with disabilities gaining timely access to the technologies and adaptations they need.

"Does CMC (computer mediated communication) present individuals with disabilities opportunities or barriers?" This is the provocative title of Gold's (1997) recent article in CMC Magazine, a query echoed in a recent US College Board report (Gladieux, & Swail, 1999). In the past, computer technologies have worked to empower people with disabilities. There is a concern, however, that today's computer and newly emerging technology-driven curricula may become barriers rather than facilitators for students with disabilities. It is understood that in the near future "e-learning" will proliferate both on and off campus (e.g., Web-Based Education Commission, 2001). For example, if a department decides to teach the majority of its courses online, and these courses are developed using web sites and authoring tools that do not adopt accessible and inclusive design standards, what are the educational implications for the 5% to 11% of postsecondary students who have disabilities (cf. CADSPPE, 1999; Henderson, 1999; Horn & Berktold, 1999; Greene & Zimbler, 1989; Disabled Students in Postsecondary Education, 1997)? Replacing a technology rich computer based learning experience for students without disabilities by a learning experience that fails to use computer technologies defeats the purpose of the original learning goal.

Students with disabilities. There is much discussion about computer and information technologies for postsecondary students with disabilities in both the mainstream and the specialized literatures. With the exception of learning disabilities, however, there is very little published empirical research evaluating how these are used by students with disabilities or how useful they are. To the best of our knowledge, with the exception of our own OLT funded investigation (Fichten, Barile, & Asuncion, 1999a) only a handful of studies have explored computer technology needs of postsecondary students with disabilities (Coomber, 1996; Killean & Hubka, 1999; NCSPES, 2000; Roessler & Kirk, 1998). Although these are important and timely investigations, a variety of concerns about each study set limits on their generalizability.

The investigation by Coomber (1996) was really an incidental aspect of an applied project designed to provide "...a curriculum guide that would facilitate educational access for students with disabilities who use adaptive technology" (p. 5). Here, "postsecondary students with disabilities were hired to interview students who use adaptive technology, disability service coordinators, and instructors who had had students using adaptive technology in their classes." (p. 5). While the questions asked are provided, sample sizes and data gathering or analysis techniques are not reported. Presumably, the sample sizes were very small and it is clear that this was not intended to be an empirical evaluation. Similarly, assistive technologies were only a minor part of the extensive focus groups conducted by the NCSPES (2000) at 10 postsecondary institutions.

The focus of another investigation was on computer related needs and services in the early and mid 1990s by 40 "recent" graduates (i.e., graduated after 1991) of a single university (Roessler & Kirk, 1998). This was a sophisticated evaluation which used a structured interview to assess students' attitudes and experiences with computer technologies and training. However, as the authors themselves point out, the sample consisted only of graduates, the impairment and disability related technological accommodations needed by participants was diverse, and most respondents received their postsecondary education "during the early to mid 90s" (p.52). Moreover, the primary emphasis in this investigation was on employment related needs and concerns.

Computer technology related questions made up only a minor part of the single large scale study which involved 349 postsecondary students with various disabilities and 70 campus based individuals who provide disability related services to students (Killean & Hubka, 1999). The goal of this questionnaire study was to review, "...services, accommodations, and policies in place at post-secondary institutions for students with disabilities" (p1). Also a Canadian investigation, this study was carried out between 1997 and 1999. Both students and disability service providers were asked to evaluate, among large numbers of questions unrelated to technology, the same 15 adaptive computer related items (e.g.,., voice recognition, Braille printers) on a scale with the following points: "Excellent," "Good," "Fair," "Poor," "Not Available," "Don't Know").

Because computer technologies were not the primary focus of this investigation, data were not presented for specific disability groups separately. This resulted in some difficulties with the interpretation of the findings. For example, students' modal answer for 14 of the 15 items was "Don't Know" (see pp. 164-168). This was followed in popularity by "Not Stated" for 13 items. Most of those who actually evaluated the items rated these favorably. However, it should be noted that there was a very substantial proportion of "Not Available" responses (about 20% of the students whose answers did not fit the "Not Stated" or "Not Answered" categories). The only exception to this was "Internet Access," which almost 50% of students rated as Good or Excellent. What is not clear here, however, is whether it is internet on the school's general use non-adapted computers that was rated highly or whether it was access to the internet on computers that had adaptive hardware or software. Overall, because the main focus of this investigation was not on computer and adaptive

computer technologies, it is difficult to make definitive conclusions about how students use computers, what equipment is needed and used, or about how well students' computer related needs are met by the institution.

Campus based individuals who provide services to students with disabilities. At most North American postsecondary institutions there is at least one designated professional whose responsibility it is to provide disability related services and accommodations to students as well as to liaise and advocate with the campus community. In many cases, ensuring that the computer technology needs of students with disabilities are met has become part of the job description. However, the background of many disability service providers has not prepared them for this rapidly evolving "high tech" component of their job. Yet, the trend to incorporate technology as part of classroom teaching and learning will necessitate increasing involvement and expertise on the part of these individuals.

There are several American (Burgstahler, 1992, 1993; Burris, 1998; Coomber, 1996; Horn & Shell, 1990; Jackson, Morabito, Prezant, & Michaels, 2001; Lance, 1996) as well as Canadian studies (Epp, 1996; Killean & Hubka, 1999) that deal, at least in part, with the views of postsecondary disability service providers about learning, computer and adaptive computer technologies. Several of these have relatively large samples (Burgstahler, 1992, 1993; Horn & Shell, 1990; Jackson, Morabito, Prezant, & Michaels, 2001; Killean & Hubka, 1999; Lance, 1996). Nevertheless, none of these provide a comprehensive picture of current realities in Canada's colleges and universities.

For example, the pioneering Horn and Shell (1990) study investigated views of 123 members of the American organization of campus based disability service providers: AHEAD. However, their return rate was only 21%. In addition, their findings show that while there were no appreciable differences between universities and junior/community colleges in either the number of students with disabilities or in the availability of adapted computer technologies, public institutions were both more likely to have students with disabilities as well as to provide specialized computer technologies for them. Perhaps most important, Horn and Shell's findings are now more than 10 years out of date.

Burgstahler's (1992, 1993) data are based on 37 individuals (61% return rate) who provide disability related services to students with disabilities in the state of Washington. She investigated computer adaptations and services only for students with visual and mobility impairments. Contrary to Horn and Shell's findings, her data suggested that junior/community colleges were more likely to provide computer related services than universities. However, Burgstahler's investigations also highlighted the discrepancy between public and private postsecondary institutions - a division not shared in the Canadian postsecondary educational system. Moreover, as was the case with Horn and Shell's (1990) data, Burgstahler's findings, too, are by now out of date.

Lance (1996) surveyed a random sample of the membership of the American organization AHEAD. With 87 respondents (46% return rate) this sophisticated investigation covered a wide range of topics related to computer and adaptive computer technologies. Even though close to 1/3 of her sample was drawn from private postsecondary institutions, Lance's findings serve as an important milestone in the evaluation of computer related views of Americans who provide disability related services to students with disabilities.

Similarly, the very recent study of a large number of AHEAD members (N = 488, return rare = 49%) by Jackson, Morabito, Prezant, & Michaels (2001) provides an interesting picture of the availability of computer and adaptive computer technologies at American postsecondary institutions. However, it should be noted that

here, too, approximately 1/3 of institutions were private rather than public. Of course, both Canada's postsecondary system and the policies related to disability accommodations are considerably different from that of the United States, especially when it comes to the Americans with Disabilities Act (ADA, 1990) and to private vs. public postsecondary institutions.

Of the two Canadian studies, Epp's (1996) investigation was targeted specifically to individuals who provide disability related services to students who use electronic text and Braille in British Columbia. Although this is an important investigation, it clearly does not - nor was it intended to - evaluate views and concerns of campus based individuals who provide disability related services to a wide range of students with disabilities in postsecondary institutions in all of Canada's provinces and territories.

The Killean and Hubka (1999) study was a wide ranging Canadian investigation of 70 (41% return rate) individuals who provide disability related services to postsecondary students. As noted earlier, given the objectives of this study, neither student nor disability service provider views about computer technologies were examined in a detailed manner. For example, in their study "Not Available" was the most popular response of disability service providers on 12 of the 15 items (see pp. 110-114). As was the case with the student sample here, also, the ratings of those who evaluated valence were mainly favorable (i.e., "Excellent" or "Good"). Nevertheless, the proportion of respondents who fell into the "Don't Know" or "Not Stated" categories was high. As with the students' ratings, internet access was clearly rated favorably. However, the same concerns as those noted about the student sample apply (i.e., it is impossible to ascertain whether it is the institution's general use internet that is evaluated favorably or whether it is access to adapted computers with internet connectivity). Nevertheless, this is an interesting and important investigation of a wide range of issues related to disability service provision at Canadian postsecondary campuses. It's scope is much broader than that of the other studies mentioned, and, in fact, it was never intended to be an in depth study of computer and adaptive computer technologies on campus.

Given the nature of the literature on the Canadian context, clearly, a more comprehensive look at the computer and adaptive computer technologies needs and concerns of individuals who provide services to postsecondary students with a variety of disabilities is needed.

Faculty and staff with disabilities on campus. Although we are aware of a handful of postsecondary educational institutions in Canada that provide computer supports to faculty and staff with disabilities (e.g., University of Alberta: cf. Vosahlo, Hyndman, Sears, & Sheridan, 2001; University of Waterloo), to the best of our knowledge there are no empirical data on demographic factors, the computer and learning technology needs of employees with disabilities, or on who is providing disability related services to them. Yet, as the population ages, so do faculty and staff. Thus, "newly disabled" older employees are likely to need disability related services, including computer adaptations. In addition, students with disabilities graduate. They, thus, become part of the employee pool of many organizations, including colleges and universities. What makes the situation of postsecondary employees with disabilities different from those in other parts of industry is that most colleges and universities have a commitment and a support structure to provide services to students with disabilities. What, if anything, does this mean for faculty and staff with disabilities?

Context Of The Present Research: Studies Carried Out By The Adaptech Project

The goal of the Adaptech Project is to provide empirically based information to assist in decision making in postsecondary education that ensures that new learning technologies, software, hardware, and policies reflect the needs and concerns of a variety of individuals: students with disabilities, the professors who teach them, the individuals responsible for making technological, adaptive, and other disability related supports available to the campus community, and the faculty and staff, including those with disabilities, who carry out the prime mission of colleges and universities: facilitation of teaching and learning. Since 1997 we have used focus groups, structured telephone interviews and questionnaires to collect data on computer and adaptive computer technologies used by university and community/junior college students with disabilities across Canada, a country where both English and French are official languages. Topics studied include: types of computer and adaptive computer technologies students with disabilities use (or wish they could use); advantages and disadvantages of the technologies; access to needed technologies both on and off campus, concerns of individuals responsible for providing services to students with disabilities; and views about training and about obtaining the necessary technologies to meet students' needs.

Our studies have had the involvement of many partners, including groupings of college and university personnel responsible for providing services to students with disabilities, consumer groups of postsecondary students with disabilities, as well as a distributor of adaptive technologies, a rehabilitation agency, and academic educational technology groupings. In addition, the research activities have been guided by an enthusiastic multidisciplinary and multisectorial bilingual cross-Canada Advisory Board.

Highlights of Adaptech Project research findings. Key findings from the series of three OLT funded studies conducted between the fall of 1997 and the spring of 1999 (Fichten, Barile, & Asuncion, 1999a) are summarised below. More information about each of these investigations is available on our Adaptech Project (2001) web page, as well as in both non-refereed (Fichten, Lavers, Barile, Asuncion, Généreux, & Robillard, 1999; Fichten, Barile, Robillard, Fossey, Asuncion, Généreux, Judd, & Guimont, 2000: Fossey, Fichten, Barile, & Asuncion, 2001a, 2001b) and refereed publications (Fichten, Asuncion, Barile, Généreux, Fossey, Judd, Robillard, De Simone, & Wells, in press; Fichten, Asuncion, Barile, Fossey, & De Simone, 2000; Fichten, Barile, Asuncion, & Fossey, 2000, Fichten, Asuncion, Barile, Fossey, & Robillard, in press).

In these investigations we explored the computer, information and adaptive computer technologies needs and concerns of Canadian university and community/junior college students. To obtain an overview of the important issues, we conducted focus groups with 12 postsecondary students with various disabilities, 6 disability service providers, 5 college and university faculty, and 7 concerned individuals from diverse stakeholder groups. In Study 2 we obtained in-depth information from structured interviews with larger and more representative samples of students with disabilities (n=37) and individuals who provide disability related services to students with disabilities (n=37). In Study 3 we collected comprehensive information via questionnaire from a Canada-wide sample of 725 university and junior/community college students. Although the data were collected in Canada, the implications of the findings have broad-based applications to other countries. The listing below summarizes the highlights of the findings.

Demographics

- Community/junior colleges, in spite of smaller overall enrollments than universities, had similar numbers of students with disabilities
- Almost half of the students had more than one impairment - this has implications for software and hardware incorporated into adapted work stations
- Only about a quarter of the students used adaptive computer technologies (e.g., screen magnification, adapted mouse), although almost half indicated needing these - the reasons: cost and lack of information about what was available.
- There were no sex differences and older and younger students did not differ on computer use or attitudes

Computer technologies

- Computer technologies have numerous important advantages for students with all types of disabilities
- Virtually all students with disabilities use computers
- Most use an IBM compatible
- The overwhelming majority of students with disabilities use the internet, mainly for research and e-mail
- There was a clear tendency to "cross use technologies" (i.e., technologies intended for students with one type of disability used by students with a different disability)
- Students used popular mainstream computer technologies, such as dictation software, spell-checkers and scanners, as disability accommodations
- Most individuals responsible for providing services to students with disabilities were interested in having broad-based collaboration from their postsecondary institution (e.g., computer support services) and wished for better links with agencies and professionals who provide rehabilitation services to students

Barriers

- There was astonishing ignorance about existing Canadian subsidy programs which help students with disabilities acquire computer technologies as assistive aids - this refers both to students with disabilities as well as to individuals responsible for providing services to students with disabilities
- The high cost of acquiring and maintaining computer technologies was the single most important and common issue noted by computer users and non-users alike - this applied to technologies both for on and off campus use and was noted by both students and individuals responsible for providing services to students with disabilities

Results from all stages of this investigation converge on a variety of important points. First, it is evident that computer technologies have incredible potential to facilitate the academic endeavors of students with all types of disabilities. Second, it is also clear that while the perceived advantages of computer technologies far outweighed the disadvantages, these technologies can act as either obstacles or facilitators for postsecondary students with disabilities. Postsecondary students with disabilities appear to have a high level of computer and internet use and literacy. In fact, most participants in the research indicated that more, more up-to-date, better, and more user friendly technologies are needed both by students with disabilities as well as by institutions enrolling students with disabilities. What is also readily apparent from the data is that there are a variety of problems and issues regarding the availability of such technologies which need to be addressed. These include concern over inadequate funding for computer and adaptive computer technologies, both for the students themselves and for the institutions; lack of information about existing subsidy programs to help students

acquire computer technologies; and the need for more information about adaptive technologies and enhanced training opportunities for students, individuals responsible for providing services to postsecondary students with disabilities as well as for faculty and computer services staff.

Our data also underscore the need for adapted work stations which accommodate the needs of students with various impairments and highlight the increasing importance of ensuring that different types of adaptive equipment be able to work together. In particular, the video card requirements of magnification software, the heavy hardware and training demands of voice recognition programs, and compatibility between dictation software and voice technologies that read what is on the screen should be taken into consideration. Consistent with this trend is the "cross-use" of adaptive technologies by students with different disabilities (i.e., for students with one kind of impairment to use technologies intended for students with a different type of disability).

These studies also provided the impetus for the present investigation by highlighting the need to target individuals who provide disability related services to students for more in depth study. Even with the limited number of disability service providers in our sample it became evident that while there were many similarities between the views of students and service providers, there were also important differences. This is consistent with results of others who have noted significant discrepancies between postsecondary students' and rehabilitation professionals' views about the suitability of adaptive technologies (e.g., Goodman, 2000). Our findings on personnel responsible for providing services to students with disabilities indicate that they have needs and concerns that are often different from those of the students. Because of the nature of their tasks, issues that affect them frequently relate to institutional concerns, budgets, relations with other sectors and departments, etc. It was clear that a more focused investigation was called for where the issues and concerns evaluated were those of relevance to disability service providers rather than students.

Present Investigation

In this companion research to our previous OLT funded project (Fichten, Barile, & Asuncion, 1999a, 1999b) the goal was to extend the scope of our research by evaluating the perspective, needs and concerns of the other part of the equation: campus based individuals who provide disability related services to students. These individuals provided their views about their own situations, gave their perceptions of the students' circumstances, and furnished information on campus wide issues, including computer related services for staff and faculty with disabilities.

To ensure that information needed by students is furnished quickly and accurately, it is imperative that staff working in offices providing services to students with disabilities be aware of new developments and have a basic understanding of how to operate adaptive computer technologies. In turn, they can transmit the knowledge to both students and professors. They also need to investigate what steps are being taken on campus to phase in new educational technologies, and to advocate with college bodies to sensitize them to the importance of making these accessible to all learners. To accomplish this, both research and practical, empirically based recommendations are needed. Here, we first provide the "science" part of the equation. We then use the findings of both the present investigation as well as our previous work on students with disabilities to generate wide-ranging practical recommendations for individuals who provide disability related services to students on campus. To assist them in the process, we also provide resources and tools of interest to practitioners.

Our research team consists of academics, researchers, students, and consumers. Several of us live with disabilities. To ensure the ecological validity of our study we obtained assistance and advice from our multisectorial and multidisciplinary bilingual Advisory Board as well as from our partners. These include:

Three postsecondary disability service provider partner groups:

- Canadian Association of Disability Service Providers in Post-Secondary Education (CADSPPE - Canada-wide)
- Le Service d'Aide à l'Intégration Des Élèves (SAIDE) at Cégep Vieux Montréal (Québec based)
- Le Services aux étudiants handicapés du Cégep de Sainte-Foy (Québec based)

Among our partners are also two student consumer groups:

- National Educational Association of Disabled Students (NEADS) (Canada-wide)
- Association québécoise des étudiants ayant des incapacités au postsecondaire (AQEIPS) (Québec based)

Specific objectives for the present investigation were:

- Evaluate the learning and computer technology related needs and concerns of individuals who provide campus based disability services to students: find out what these are and propose solutions to problems so that people with disabilities are better served in postsecondary institutions
- Explore institutional concerns: evaluate how the institution's computer and learning technologies could better accommodate the learning needs of students with disabilities
- Assess the computer and adaptive computer relevant services and accommodations available to faculty and staff with disabilities: explore their needs

METHOD AND FINDINGS

Overview

During the spring of 2000 a structured interview consisting of 38 sets of questions was developed and administered by telephone to 156 postsecondary personnel responsible for providing services to students with disabilities. Respondents were selected from a pool of 183 postsecondary educational institutions which were listed on the web pages of the Association of Community Colleges of Canada (ACCC) or the Association of Universities and Colleges of Canada (AUCC). Interviews consisted of 38 sets of questions and lasted between 5 and 25 minutes. Participants represent 146 postsecondary educational institutions: 91 colleges and 55 universities. The overall participation rate was 80%.

Participants

Participants were 156 postsecondary personnel responsible for providing services to students with disabilities (110 females and 46 males). Ninety-six worked in a college, 58 in a university, and 2 in a postsecondary distance education institution (1 college and 1 university). Overall, participants had worked for an average of 9 years providing services to students with disabilities (range <1 to 26).

Participants represent 91 of the 115 colleges and 55 of the 68 universities that were listed on the web pages of the Association of Community Colleges of Canada (ACCC) (2000) or the Association of Universities and Colleges of Canada (AUCC) (2000) on April 22, 2000. Interviewees met the following criteria: (1) enrolled students, (2) did not indicate that they had no students with disabilities currently enrolled, and (3) did not indicate that another postsecondary institution was looking after services for students with disabilities. Several institutions have 2 or more campuses which are not individual members of AUCC or ACCC and which have different individuals responsible for services to students with disabilities (e.g., some provinces have a regional colleges system with campuses in several cities). At several institutions, different individuals were responsible for services for students with specific impairments (e.g., learning disability versus other disabilities). In these cases we attempted to interview all these individuals. This resulted in more than one individual being interviewed in the case of 10 postsecondary institutions: 4 Alberta colleges, 1 British Columbia college, 2 Ontario universities, 1 Nova Scotia college, 1 New Brunswick university, and 1 other university located in the Atlantic provinces. Thus the 156 participants represent 146 independent members of the Association of Community Colleges of Canada (ACCC) or the Association of Universities and Colleges of Canada (AUCC). Whenever an institution was a member of both ACCC and AUCC, the institution was counted as a college rather than a university. This was done because most college and "university-college" members of AUCC did not have charters to grant their own degrees. Rather, they typically provided credits that could be transferred to a university. The overall participation rate was 80%: 79% participation from the colleges, 81% from universities, and 67% from postsecondary distance education institutions. Details related to institutional participation rates by province and college, university, and distance education status are presented in Table 1.

See Table 1 in Appendix A

Table 2 shows that 116 (74%) respondents represented anglophone institutions, 39 (25%) represented francophone institutions, and 1(1%) represented a bilingual institution. 31 of the 39 respondents (80%) representing francophone institutions were from Québec. The rest were from other provinces, as was the single bilingual university.

See Table 2 in Appendix A

Procedure

To recruit participants we attempted to contact, by telephone, the 247 members of the AUCC (2000) and the ACCC (2000) that were listed on their web sites on April 22, 2000 (see Table 1 for a summary). Whenever an institution was a member of both ACCC and AUCC, the institution was counted as a college rather than as a university. This was because most college and "university-college" members of AUCC did not have charters to grant their own degrees. Rather, they typically provided credits that could be transferred to a university.

We asked to speak to the person responsible for providing services to students with disabilities. Table 1 shows that of the 247 institutions/campuses listed, 46 were ineligible for participation, mainly because their services for students with disabilities were handled by another campus or institution. Three institutions had no students - they were merely administrative or research units. 15 had students, but no students with disabilities enrolled. This left 183 eligible institutions.

Potential participants at the 183 eligible institutions were asked to volunteer. Anglophone institutions were contacted by an English speaking researcher and francophone institutions by a French speaking researcher. Bilingual institutions were contacted in either language. Despite repeated attempts to contact the individual responsible for providing services to students with disabilities we were unable to reach 11 institutions. 26 individuals contacted either refused to participate outright, mostly citing time constraints, or we were unable to make appointments due to problems with scheduling and unreturned phone calls. At 10 institutions we were informed that we should contact a second individual to get a full picture either (1) because the institution contacted had 2 or more campuses which were not individual members of AUCC or ACCC and had a designated individual responsible for services to students with disabilities on that campus or (2) because different individuals were responsible for services for students with specific impairments (e.g., learning disability versus other disabilities). In these cases we attempted to interview all service providers. The 156 participants represent 91 of the 115 (79%) colleges and 55 of the 68 (81%) universities which told us that they had students with disabilities.

A time was scheduled for those who agreed to be interviewed. To assist in the process, interview questions were faxed or e-mailed prior to the scheduled appointment. This included an informed consent form that can be seen in Appendix C.

See Appendix C

At the scheduled time, participants were reminded about the goals of the project, their right to withdraw at any time without penalty, and the precautions taken to ensure confidentiality. To encourage honest responses, even if these did not reflect well on their educational institution, participants were assured that the information that they provided would never be linked either to themselves or to their educational institution. This was done because it is common in the field to publish descriptive comparative "accessibility profiles" of educational institutions.

Interviews were conducted during the spring of 2000. Interview questions were based on findings from our previous studies. The interview protocol went through multiple drafts and both English and French. Versions were carefully examined by our Advisory Board as well as by members of our Adaptech online community. The interview was pre-tested by a small group of both francophone and anglophone individuals responsible for providing services to students with disabilities.

During the telephone interview the interviewer read each question and gave the respondent ample time to answer. Clarification was provided if participants were unsure of the meaning of particular questions. In some cases, participants who had filled out the questionnaire ahead of time, simply read their responses to the questions in numerical order. In a limited number of cases, interviewees faxed or e-mailed their responses.

Structured Interview Questions

The final structured interview consisted of 60 items. Both English and French versions are available in Appendix C. Most items used 6-point Likert scales (1 = strongly disagree, 6 = strongly agree).

See Appendix C

Most items took two forms: "actual situation," which asked about the current situation at the respondents' campus or sector, and "desired situation," which asked about what would make things better. "Actual situation" items were generally positively worded, described a set of conditions at the institution (e.g., computer equipment is up-to-date), and stated that the characteristic met the needs of students with disabilities (e.g., *At my institution, computer and/or adaptive computer technologies are sufficiently up-to-date to meet the needs of students with disabilities*).

The "desired situation" items revolved around making the interviewee's job easier to perform if certain conditions were to be met (e.g., *It would make my job easier if students with disabilities were knowledgeable users of computer and/or adaptive computer technologies*). For 12 topics the two types of items, "actual situation" and "desired situation," were paired (e.g., *"The availability of adaptive computer technologies in specialized labs/centres for students with disabilities at my institution meets their needs"* and *"It would make my job easier if there were more adaptive computer technologies available in specialized labs/centres at my institution"*). This allowed for comparisons between actual and desired circumstances. A key criterion item inquired about how well, overall, the computer and/or adaptive computer technology needs of students with disabilities are met at the respondent's institution.

The questions were also designed to evaluate several concepts, with both "actual situation" and "desired situation" questions being included in each. Grouping concepts are as follows.

1. Inside and outside the institution
   - Funding for institution's adaptive computer technologies

2. Inside the institution
   a. Access to adaptive computer technologies
   - Up-to-date computer technologies
   - Hours of access to computers
   - Off-campus loan programs
   - Availability in specialized labs/centres
   - Physical space available for computer technologies
   - Training for students on adaptive computer technologies
   - Availability in general use computer labs

   b. Internet/library and adaptive computer technologies
   - Enough adapted computers with internet access
   - Library's computers accessible
   - Accessible internet based distance education

   c. Support for adaptive computer technologies
   - Technical support
   - Consulted when computer infrastructure decisions made
   - Opportunities for employees to learn about adaptive technologies
   - Advisory/steering committee deals with computer accessibility
   - Administration reacts positively concerning computer accessibility
   - Computer support people can service adaptive technologies
   - Specialist in adaptive computer technologies on campus

   d. Faculty and computer accessibility
   - Accessible computer based teaching materials used by professors
   - Faculty trained in adaptive computer technologies

3. Outside the institution factors
   - Agencies provide students with appropriate equipment
   - Agencies provide students with adequate training

4. Personal factors
   - Knowledgeable about adaptive computer technologies

Demographic, enrollment, and job related information. Additional items inquired about the institution's name and the campus (and disability related sector, if applicable) for which the respondent was responsible, demographic information about the institution and students with disabilities (*"Approximately how many students with all types of disabilities, documented or not, including learning disabilities, are enrolled at your institution?"* and *"Approximately what is the total student enrollment at your institution? (This includes students with and without disabilities and refers to the same campus(es) as the previous question)"*), as well as personal factors, including how knowledgeable respondents were about adaptive computer technologies, how many years they had worked providing services to students with disabilities, and on a 4-point scale (1 = very high priority, 4 = very low priority), the priority they placed upon providing computer related services.

We inquired whether there were computer or adapted computer technologies at respondents' institutions for students with disabilities and whether a provincial/regional loan program supplied some or all of the computer and/or adaptive computer technologies at the respondent's institution. Three questions dealt with faculty and staff with disabilities. We asked about the number of employees with disabilities at the respondent's institution, whether the respondent or the office for students with disabilities provide computer related services for these employees, and if not, then who should do so.

RESULTS

Characteristics Of Individuals Who Provide Disability Related Services To Students With Disabilities

It can be seen in Table 2 that the sex distribution for individuals responsible for providing services to students with disabilities indicates that women outnumber men by a ratio of 2:1 (i.e., 110 women and 46 men = 71% women). Values in Table 3 show that the ratio was similar in all institution types (anglophone college: 72% female, francophone college: 59%, anglophone university: 73%, francophone university: 67%).

Participants had an average of 9.25 years of experience working with students with disabilities (with a median of 9.50 and a mode of 10 years). However, years of experience ranged from less than 1 year to 26 years. A 3-way ANOVA (2 Sex (Female/Male) x 2 Institution (College/University) x 2 Language (Anglophone/Francophone) presented in Table 3 showed that anglophone service providers had more experience (M = 9.86 yr) than francophone service providers (M = 7.41 yr), $F(1,143)=4.93$, $p<.05$. Males (M = 10.73) had more experience than females (M = 8.60), $F(1,143)=4.29$, $p<.05$. The main effect for institution was not significant. Nor were any of the interactions.

See Table 3 in Appendix A

- Sex distribution for individuals responsible for providing services to students with disabilities: 2/3 females
- Service providers had, on average, between 9 and 10 years of experience, although there was great variability
- Males had more years of experience working with students with disabilities than females and anglophones had more experience than francophones
- Experience of college and university service providers did not differ significantly

Overall, participants indicated that they were not especially knowledgeable about adaptive computer technologies. The mean score was 3.70 (SD = 1.52) on a 6-point scale, with higher scores indicating being more knowledgeable. Indeed, the scores of 12% of participants suggest that they were not at all knowledgeable, while only 9% of scores suggest that the respondent was an expert. A 3-way ANOVA (2 Sex (Female/Male) x 2 Institution (College/University) x 2 Language (Anglophone/Francophone) presented in Table 3 indicates that while there were no significant differences between males and females or between individuals from colleges and universities, francophone respondents felt that they were less knowledgeable (M = 2.97) than their anglophone colleagues (M = 3.93), $F(1,143)=5.83$, $p<.05$. Additional details are available in Table 3.

See Table 3 in Appendix A

- Generally, participants were not very knowledgeable about computer technologies for students with disabilities
- Francophone service providers were less knowledgeable than anglophone service providers
- There were no significant differences between males and females or between college and university based staff

Enrollment: Students Registered to Receive Disability Related Services in Canada's Colleges and Universities

Participants responded to the following 2 questions.

- "Approximately how many students with all types of disabilities, documented or not, including learning disabilities, are enrolled at your institution?"
- "Approximately what is the total student enrollment at your institution? (This includes students with and without disabilities and refers to the same campus(es) as the previous question.)"

Data in Table 4 indicate that the mean percentage of students with disabilities at participating institutions was 3.58%. However, there were great discrepancies among institutions (range: <.01% to 35.64%, SD = 4.20%, median = 2.21%). Similarly, although average overall enrollment at participating postsecondary institutions was 8606, again there was great variability (range = 40 to 45,000, SD = 9559, median = 128). The same was true of the mean number of students with disabilities enrolled. While the mean was 215 students with disabilities, scores ranged from 1 to 1800 (SD = 262).

See Table 4 in Appendix A

It should be noted that an alternate form of calculation of the percentage of students with disabilities at the same 156 institutions results in a different, lower value. The computation above is based on calculating the percentage of students with disabilities for each institution and taking the mean. An alternate technique is to divide the average number of students with disabilities at the 156 institutions (M = 215) by the average overall enrollment in those schools (M = 8606). This results in the percentage dropping to 2.50%. This occurs because there are more colleges in the sample. While smaller than universities, these have a larger proportion of students with disabilities. Therefore, the two types of averages are likely to be different. To ensure that comparable figures are used when comparing studies, it is important to ascertain which computational method was used.

In addition, it should be noted that 15 of the 198 institutions on the AUCC or ACCC lists (8%) indicated that although they had a student body, they currently had no students with disabilities. To better understand the reasons for the large variability in scores we examined variables related to enrollment of students with disabilities in a variety of ways.

- On average, depending on the method of calculation, between 2-1/2% and 3-1/2% of postsecondary students are registered with their institution to receive disability related services
- There is great variability both in the overall size of postsecondary institutions as well as in the number of students with disabilities they enroll
- 8% of postsecondary educational institutions had no students with disabilities

Differences between colleges and universities. In general, it can be seen in Table 5 that mean overall enrollment of colleges (M = 5648) was significantly lower than that of universities (M = 13,455), $t(152)=5.30$, $p<.001$. The total number of students with disabilities, however, was very similar (M = 211 and M = 217, respectively), $t(150)=.13$, p=ns. It is, therefore, not surprising that t-test results indicate that a significantly larger percentage of college students have a disability (M = 4.44%) than university students (M = 2.11%), $t(150)=4.10$, $p<.001$.

See Table 5 in Appendix A

- Universities are, on average, approximately twice as large as colleges, yet they enroll similar numbers of students with disabilities
- Larger proportions of college students are registered to receive disability related services from their institution than university students (i.e., approximately 3-3/4% to 4% vs. 1-1/2% to 2%)

Differences among provinces and territories. Summary data on student enrollments broken down by province and college versus university status are available in Table 4. Means and standard deviations in Table 4 show that, with the exception of 1 outlier score, the average percentage of students with disabilities at participating institutions ranges from 2% to 6% in all provinces. The outlier is Québec, where the percentage of students with disabilities is substantially lower: approximately 0.55% (i.e., only 1/2 of 1%). A 1-way ANOVA (10 Provinces) comparison of all provinces indicates that there was a significant difference among the provinces in the proportion of their students with disabilities, $F(9,148)=4.27$, $p<.001$. The Tukey HSD test shows that only 2 scores are significantly different ($p<.05$) from each other. These show that Québec enrolled a significantly lower percentage of students with disabilities than either Alberta or Ontario. None of the other provinces were significantly different from each other. To ascertain whether this difference was due to language or to differences in provincial policies we conducted a series of analyses on provincial and linguistic variables.

- The average percentage of postsecondary students with disabilities registered to receive disability related services varies from 1/2% to 6% in Canada's 10 provinces
- Québec has a substantially lower proportion of postsecondary students with disabilities than the other provinces

Colleges and universities in Québec and the rest of Canada. First, we examined differences between institutions in Québec and in provinces in the rest of Canada by conducting a series of 2-way analysis of variance (ANOVA) comparisons (2 Institution (College/University) x 2 region (Quebec/Rest of Canada)). Dependent variables were: total enrollments, enrollments of students with disabilities, and percentage of students with disabilities. Of interest are main effects for region and interactions with the region variable. Means and test results presented in Table 6 indicate that the average enrollment in postsecondary institutions in Québec ($M=7886$) and the rest of Canada ($M = 8795$) do not differ significantly. There was, however, a significant interaction of region and institution on this variable showing that, on average, Québec's colleges are relatively smaller and Québec's universities relatively larger than those in the rest of Canada, $F(1,150)=4.13$, $p<.05$.

See Table 6 in Appendix A

- On average, Québec colleges are relatively smaller and Québec universities are relatively larger than their counterparts in the rest of Canada
- Overall postsecondary enrollment in Québec and the rest of Canada do not differ

The situation was somewhat different when enrollment of students with disabilities was considered. Here, data in Table 6 show only that the mean number of students with disabilities enrolled in postsecondary institutions is significantly lower in Québec ($M = 48$) than in the rest of Canada ($M = 263$), $F(1,148)=15.93$, $p<.001$.

- The mean number of students with disabilities enrolled in postsecondary educational institutions is lower in Québec than in the rest of Canada

Perhaps the most compelling difference was found on the percentage of students with disabilities. Results in Table 5 show a significant main effect for region, $F(1,148)=23.66$, $p<.001$. In addition, the interaction effect approached significance, $F(1,148)=3.80$, $p=.05$. As the means and Figure 1 indicate, Québec has a substantially smaller percentage of students with disabilities both at the college ($M = 0.62\%$ vs. $M = 5.66\%$) as well as at the university levels ($M = 0.41\%$ vs. $M = 2.56\%$), with the difference being most pronounced in colleges.

See Figure 1 in Appendix B

- Québec has a smaller proportion of students with disabilities both at the college (0.6% vs. 6%) and university levels (0.4% vs. 3%), with the difference being greatest in colleges

Linguistic differences across Canada. Are the scores in Québec related to linguistic differences or to differences in provincial policies and practices? To answer this question we conducted another series of ANOVAs, this time using language rather than region (2 Institution (College/University) x 2 Language (Anglophone/Francophone)). Of interest are main effects for language and interactions with the language variable. Data in Table 6 and Figure 2 show that although none of the interactions were significant, the results were very similar to those on region, except that differences were generally somewhat smaller.

See Figure 2 in Appendix B

- Overall mean enrollment in francophone and anglophone educational institutions is similar
- The average number of students with disabilities enrolled in francophone postsecondary education is lower than that in anglophone institutions
- Smaller proportion of francophone than anglophone postsecondary students are registered to receive disability related services from their postsecondary institution.

Because most of the francophone institutions are from Québec (N=31 vs. N=8 outside the province), the previous analysis was not a compelling test. Therefore, we conducted 3 series of comparisons examining the dependent variables in: francophone institutions in Québec and elsewhere; anglophone institutions in Québec and elsewhere; and in anglophone and francophone institutions in Québec. We conducted separate evaluations for francophone colleges and for francophone universities in Québec and the rest of Canada because the number of francophone universities outside Québec (N=2) was too low for inferential statistical analysis.

In the case of francophone colleges inside and outside Québec we performed a t-test. The significance test here is very stringent because of the sample sizes. The number of francophone colleges was 21 in Québec but only 6 in the rest of Canada. Means and test results in Table 7 show that while mean overall enrollment in francophone colleges in Québec ($M = 3093$) was significantly greater than in francophone colleges elsewhere in Canada ($M = 515$), $t(25)=3.41$, $p<.01$, the mean number of students with disabilities enrolled did not differ significantly ($M = 17$ and 23, respectively), $t(25)=.32$, $p=ns$. The test on the percentage of students with disabilities in Québec colleges, however, approached significance and showed that the mean percentage of students with disabilities was substantially lower in Québec francophone colleges than in francophone colleges outside Québec ($M = 0.59\%$ and 4.91%, respectively), $t(25)=3.83$, $p<.001$.

See Table 7 in Appendix A

- Francophone colleges in Québec are larger than francophone colleges outside Québec
- No difference in number of students with disabilities enrolled in francophone colleges inside and outside Québec
- Québec francophone colleges have a smaller proportion of students with disabilities than francophone colleges outside Québec (.6% vs. 5%)

It was not appropriate to conduct inferential statistical tests when evaluating francophone universities and anglophone colleges and universities inside and outside Québec because of sample sizes. For example, there were only 2 francophone universities outside Québec and only 2 anglophone colleges and 2 anglophone universities inside Québec. Means and standard deviations for these comparisons are, however, available in Table 7.

In general, these show that on average, universities in Québec, both francophone and anglophone, have substantially greater overall enrollment than those in the rest of Canada. Anglophone colleges in Québec and the rest of Canada are, however, similar in size. When it comes to the percentage of students with disabilities, however, regardless of language or college or university status, the proportion of students with disabilities in Québec institutions is substantially lower. These relationships can best be seen in Table 8 and Figure 3, which compare anglophone and francophone colleges and universities inside and outside Québec and illustrate the percentage of students with disabilities enrolled in a bilingual institution as well as in distance education. As Figure 3 clearly shows, both the province as well as the language are related to the percentage of students with disabilities, with both province and language having independent effects. This results in Québec francophone institutions having the lowest proportions of students with disabilities.

See Table 8 and Figure 3 in Appendix B

- On average, both anglophone and francophone universities in Québec are larger than those in the rest of Canada
- Anglophone colleges in Québec and the rest of Canada are similar in size
- Location in Québec and speaking French are both related to lower percentage of students with disabilities, with both province and language having independent effects
- Regardless of language or college or university status, the proportion of students with disabilities in Québec institutions is substantially lower

Synthesis. The results show that there is a smaller proportion of students with disabilities in Québec colleges and universities than in institutions in the rest of Canada. Analyses which attempted to unconfound language and province factors were only partially successful in answering the question," Is the difference due to language or to differences in provincial policies?" because of the limited number of anglophone institutions inside Québec and the limited number of francophone institutions outside Québec. The closest approximation to an answer than we can propose is that most of the difference is due to provincial policies and practices, with a smaller but independent role for language.

Important differences were found between colleges and universities, suggesting that data from colleges and universities should be analyzed separately. In addition, there were substantial differences between anglophone and francophone institutions as well as between institutions inside and outside Québec.

Because there is no way to unconfound province of origin and language, and because there were important differences found, here we will analyze data for anglophone and francophone colleges and universities separately. Although "Québec" and "francophone" are confounded, as are "rest of Canada" and "anglophone," the alternative of doing province by province analyses on anglophone and francophone colleges and universities is impractical due to sample size limitations. Thus, all references to linguistic differences could also be construed as differences between Québec and the other provinces - at this point there is no way to examine these separately.

Is The Size Of The Institution Related To The Percentage Of Students With Disabilities?

Because of substantial differences in total enrollments we wanted to find out whether institution size was related to the proportion of students with disabilities. To explore this possibility we correlated the percentage of students with disabilities with total enrollment for all institutions as well as for anglophone and francophone colleges and universities separately. Pearson product-moment correlation coefficients in Table 9 indicate a weak but significant negative relationship between overall enrollment and the percentage of students with disabilities, $r(152)=-.229$, $p<.01$. This indicates that the larger the institution, the smaller the percentage of students with disabilities. When this relationship was examined separately for colleges and universities, the coefficients show that while the relationship was significant for anglophone institutions, it was nonsignificant for francophone universities and only approached significance for francophone colleges.

See Table 9 in Appendix A

In a previous investigation we found that the relationship between the size of Québec's colleges and the percentage of students with disabilities was not significant (ref ITAC). Therefore, the analysis was redone based on the 21 Québec francophone colleges in the current sample. In this case, the correlation between the size of Québec's colleges and the percentage of students with disabilities was not significant, $r(19)=-.055$, p=ns. This suggests that the findings which showed that the correlation approached significance for francophone colleges is due to the influence of colleges outside Québec. Thus, it appears that there is a significant negative relationship between institution size and the percentage of students with disabilities for anglophone colleges and universities, with larger institutions enrolling smaller proportions of students with disabilities. In the case of francophone institutions, there is no significant association between institution size and the proportion of students with disabilities.

- The proportion of students with disabilities is significantly and negatively related to total overall enrollment (i.e., larger institutions have a smaller proportion of students with disabilities), but only in anglophone colleges and universities

Institutions With And Without Computer And Adaptive Computer Technologies On Campus For Students With Disabilities

Of the 154 non-distance education respondents, 132 (86%) indicated that they had equipment for students with disabilities and 22 (14%) indicated that they did not. It can be seen in Table 10 that there were few - and nonsignificant - differences between comparable anglophone and francophone institutions. However, colleges (81%) were significantly less likely than universities (93%) to have computers for their students with disabilities, $X^2(1)=4.00$, $p<.05$.

See Table 10 in Appendix A

- Most institutions had computer equipment for their students with disabilities
- There were no significant differences between anglophone and francophone institutions
- Colleges were less likely than universities to have computers for their students with disabilities

To determine whether institutions which did and did not have computer equipment for students with disabilities on campus differed in enrollment, we conducted a series of independent t-tests on enrollment statistics. Because virtually all universities had students with disabilities, we did this only for colleges. While the means in Table 11 suggest that colleges with equipment were larger, had more students with disabilities, and had a larger proportion of students with disabilities than those which did not have equipment, the t-tests on these variables were not significant. Given the enormous standard deviations, this is not surprising.

See Table 11 in Appendix A

- Although there was a suggestion that colleges with equipment for their students with disabilities had larger numbers of students with disabilities enrolled in their programs than colleges with no equipment, the relationship was not significant

Only 23% of respondents indicated that they had a multidisciplinary advisory/steering committee which deals with the accessibility of computer technologies for students with disabilities. It can be seen in Table 12 that while 34% of universities had such a committee, only 17% of colleges did so. Neither distance education institution had a committee. Linguistic differences favored anglophone institutions, although the differences were not significant.

See Table 12 in Appendix A

- Less than 1/4 of institutions had had a multidisciplinary advisory/steering committee which deals with the accessibility of computer technologies for students with disabilities
- Universities were somewhat more likely than colleges to have an advisory/steering committee which deals with the accessibility of computer technologies for students with disabilities

All advisory/steering committees had a representative of the office for students with disabilities. Most (88%) had an administrator, a student with a disability (81%) and a faculty member (78%). However, very few had nondisabled students (31%). It is especially noteworthy that only 1/4 (25%) of committees had staff from computer services.

- Advisory/steering committees generally had at least one representative of the office for students with disabilities, the administration, students with disabilities, and the faculty
- Only 1/4 of committees had computer services staff representation

Table 12 reveals that the priority placed upon computer related services was moderately high (when weighted against all other disability-related support services), with a mean of 2.25 (SD =.87) on a 4-point scale where 1 indicates very high priority, 2 indicates high priority, 3 indicates low priority, and 4 indicates very low priority). Table 12 also shows that most colleges and universities accorded high priority to computer related services (65% of institutions accorded this either "high" or "very high" priority), but that universities accorded somewhat higher priority to computer related services than colleges. The 2 distance education institutions followed suit, with the distance education university placing higher priority (score = 2) than the distance education college (score = 3). Francophone and anglophone institutions were quite similar. A 3-way ANOVA (2 Institutions x 2 Language x 2 Computer Technologies on Campus (Yes/No)) showed no significant main effects or interactions. This indicates that colleges and universities with and without computer technologies on campus did not differ on priority rating.

- Postsecondary institutions generally accorded moderate priority to computer related services
- Universities accorded somewhat higher priority to computer related services than colleges
- There were no differences based on language

Provincial/regional computer technology loan programs to institutions. Of the 132 institutions which indicated that they had computer technologies on campus for their students, 35 (27%) indicated that a provincial/regional loan program supplied some of the computer and/or adaptive computer technologies on campus. Mean response to the question inquiring about perceptions of the adequacy of resources provided by the loan program in meeting the needs of students with disabilities was 4.72 (SD = 1.43) on a 6-point scale, indicating considerable satisfaction. There was no significant difference on this variable between colleges and universities or between anglophone or francophone institutions. Indeed, only 16% of respondents indicated that the equipment provided failed to meet students' needs.

- Only slightly more than 1/3 of institutions had a provincial/regional loan program which supplied some of their computer and/or adaptive computer technologies
- In general, these loan programs were viewed very positively in meeting students' needs

Good Institutional Computer and Adaptive Computer Technologies

A key item was rating, on a 6-point Likert scale, on the following item.

> *"Overall, the computer and/or adaptive computer technology needs of students with disabilities at my institution are adequately met."*

It can be seen in Table 13 that the computer related needs of students were moderately well met at their institutions (mean = 4.20 on a 6-point scale, SD = 1.40, range 1-6, median = 5). Means and the 2-way ANOVA (2 Institution x 2 Language) presented in Table 13 shows that there was no significant difference between colleges and universities or between anglophone and francophone institutions. The interaction between language and institution was also nonsignificant.

See Table 13 in Appendix A

- The computer related needs of students were moderately well met at their institutions
- This was true for both anglophone and francophone colleges and universities

Correlates of good institutional computer and adaptive computer technologies. To explore institutional factors important in adequately meeting the computer related needs of students we computed a series of Pearson product-moment correlation coefficients between scores on variables in the structured interview and scores on the item concerning the overall rating about how well students' computer related needs were met. This was done for all institutions combined as well as for anglophone and francophone colleges and universities separately. It can be seen in Table 14 that neither the size of the institution, nor the number or percentage of students with disabilities was related consistently to the adequacy of meeting students' computer and adaptive computer technology needs.

See Table 14 in Appendix A

- Size of the institution, the number and the proportion of students with disabilities were unrelated to overall adequacy in meeting students' computer and adaptive computer technology needs

Comparisons of non distance education institutions with (N = 132) and without computers (N=22) on campus for students with disabilities on overall adequacy in meeting students' computer and adaptive computer technology needs are presented in Table 15. These show that, surprisingly, there was no significant difference between institutions that did and those that did not have equipment on campus for their students, $t(136)=1.63$, p=ns.

See Table 15 in Appendix A

- On the overall evaluation about how well students' computer related needs are met there was no significant difference between institutions that did and those that did not have equipment on campus for their students with disabilities

Correlations between scores on variables in the structured interview and scores on the item concerning the overall rating about how well students' computer related needs were met are presented in Table 16. Coefficients based on all institutions combined as well as on anglophone and francophone colleges and universities separately show the following.

See Table 16 in Appendix A

Aspects important in meeting the computer related needs of students with disabilities are:

- Funding for the institution's adaptive computer technologies is one of the most important factors for all types of institutions

- All aspects of access to adaptive computer technologies, including (in rank order):
  1. Up-to-date computer technologies
  2. Off-campus loan program
  3. Availability in specialized labs/centres
  4. Training for students on adaptive computer technologies
  5. Physical space available for computer technologies
  6. Hours of access to computers
  7. Availability in general use computer labs

- All aspects of internet/library and adaptive computer technologies, including (in rank order):
  8. Enough adapted computers with internet access
  9. Accessible library computers
  10. Accessible internet-based distance education

- Most aspects of support for adaptive computer technologies on campus, including (in rank order):
  11. Technical support
  12. Specialist in adaptive computer technologies on campus
  13. Opportunities for employees to learn about adaptive technologies
  14. Administration reacts positively concerning computer accessibility

- One of two aspects related to faculty:
  15. Accessible computer based teaching materials used by professors

- One of two outside the institution factors:
  16. Agencies provide students with adequate training

- The single personal factor:
  17. How knowledgeable the disability service provider is about adaptive computer technologies

To evaluate whether having computer equipment on campus for students with disabilities was related to these aspects we conducted a series of t-tests on appropriate variables. Means and test results presented in Table 15 show that only 1 of 13 comparisons were significant. After a Bonferroni correction to the alpha level, even this failed to attain significance.

The presence of computer equipment on campus for students with disabilities was not related to factors important in meeting the computer related needs of students

"Actual Situation": Adequacy Of Various Aspects Of Computer Technologies At Colleges and Universities In Meeting The Computer Related Needs Of Students With Disabilities

Respondents' scores on the adequacy of various aspects of computer technologies at colleges and universities in meeting the computer related needs of students with disabilities are presented in Table 13.

Funding for the institution's computer technologies. Scores in Table 13 indicate a mean of 3.50 on a 6-point scale on a question about the adequacy of funding for the institution's computer technologies, with higher scores indicating more favorable responses. In fact, 19% of respondents strongly disagreed with the statement that the level of funding at their institution for computer and adaptive computer technologies was adequate in meeting students' needs, with an additional 20% disagreeing moderately. 6% disagreed slightly. Only a little more than half of the respondents indicated that funding was adequate.

- Funding for the institution's computer technologies for students with disabilities was rated as inadequate to meet students' needs by almost half of the respondents

Access to adaptive computer technologies. Table 13 also shows that of the factors related to access, the hours of access to computers and the extent to which they were up-to-date were reasonably good (scores greater than 4 on a 6-point scale). The availability of adaptive computer technologies in general use computer laboratories was however, seen as less than adequate (score =< 3). Only 76 institutions indicated that they had an off campus computer technology loan program for students.

- Adequate in meeting the needs of students: hours of access to computers and the extent to which they were up-to-date
- Inadequate in meeting the needs of students: availability of adaptive computer technologies in general use computer laboratories
- Approximately half of the institutions had an off campus computer technology loan program for students

Internet/library and adaptive computer technologies. When it came to internet and library access issues, the data in Table 13 indicate that internet based distance education was seen as inadequate in meeting the needs of students with disabilities (score =< 3). It should be noted, however, that many participants reported that their institutions did not offer internet based distance education courses.

- Many institutions did not have internet based distance education courses - those which did generally had poor accessibility for students with disabilities

Support for adaptive computer technologies. Table 13 also shows that the only favorable aspect of support for adaptive computer technologies was the administration's positive response (score greater than 4 on a 6-point scale). Other aspects of support were seen as somewhat or very problematic. For example, available technical support, the presence of an adaptive computer technologist on campus, and the ability of computer support staff to service adapted computer technologies had ratings between 3 and 3.49, as did opportunities for employees to learn about computer and adaptive technologies. The degree to which individuals who provide services to students with disabilities are consulted when computer infrastructure decisions are made and the existence of an advisory/steering committee that deals with computer accessibility were seen as inadequate in meeting the needs of students with disabilities. As noted earlier, only 23% of institutions had an advisory/steering committee that deals with computer accessibility.

- Adequate in meeting the needs of students: administrations generally respond favorably when it comes to issues related to the accessibility of computers to students with disabilities
- Mediocre or inadequate in meeting the needs of students: available technical support, the presence of an adaptive computer technologist on campus, the ability of computer support staff to service adapted computer technologies, opportunities for employees to learn about computer and adaptive technologies, the degree to which individuals who provide services to students with disabilities are consulted when computer infrastructure decisions are made, the existence of an advisory/steering committee that deals with computer accessibility

Faculty and computer accessibility. Table 13 also reveals that, according to the participants, computer based teaching materials used by professors are only minimally accessible. In addition, when faculty are trained to use computer technologies in their courses, making their courses accessible to students with disabilities is rarely part of the curriculum (score less than 2).

- Inadequate in meeting the needs of students: Computer based teaching materials used by faculty are problematic, faculty training on computers fails to address accessibility issues

Outside the institution factors. As for factors that pertained to variables outside the institution, it can be seen in Table 13 that disability service providers generally felt that outside agencies provide students with appropriate equipment, although they were somewhat less positive about the training provided to students by these agencies.

- Adequate in meeting the needs of students: outside agencies provide students with appropriate equipment
- Mediocre/inadequate in meeting the needs of students: computer training provided to students by these agencies

Similarities and differences between anglophone and francophone colleges and universities. Mean scores on the adequacy of various aspects of computer technologies in meeting the needs of students with disabilities at anglophone and francophone colleges and universities are also presented in Table 13. Here we present F test results for a series of 2-way multivariate and univariate analysis of variance comparisons (MANOVAs and ANOVAs) to compare linguistic and institutional factors (2 Institution (College/University) x 2 Language (Anglophone/Francophone). The means and the test results indicate that while institution type was important in some cases (a near significant finding on 1 of the 5 MANOVAs), language was clearly a more important variable (significant findings on 3 of the 5 MANOVAs and on the single ANOVA not included in any of the MANOVAs). None of the MANOVA interaction effects were significant, indicating that language and institution type did not interact to affect scores. Examination of the ANOVAs shows significant or near significant findings only on 6 of the 22 institution variables investigated. When language was examined, 12 of the 22 comparisons were significant or approached significance. In general the results suggest that universities fare somewhat better than colleges (5 of the 6 significant or near significant comparisons favor universities) and francophone institutions fare better than anglophone institutions (10 of the 11 comparisons favor francophone institutions). Figure 4 illustrates the findings.

See Figure 4 in Appendix

- There were relatively few differences between colleges and universities
- Where there were institutional differences, ratings at universities were generally more favorable than those at colleges
- There were many linguistic differences, with ratings at francophone institutions being generally more favorable than those at anglophone institutions

"Actual" vs. "desired situation:" adequacy of various aspects of computer technologies at colleges and universities in meeting the computer related needs of students with disabilities. To help compare "actual" and "desired" situations when it comes to the adequacy of meeting the computer related needs of students with disabilities Table 17 provides "actual situation" means as well as uncorrected means for the series of "desired situation" items ("It would be helpful if..."). It should be noted, however, that "desired situation" scores need to be interpreted in the context of the "actual situation" in each institution. That "desired situation" scores need to be interpreted in the light of actual realities is made evident by test results in Table 17. These show that scores on 11 of the 12 "paired" items (i.e., paired "actual situation" and "desired situation" items) are significantly negatively correlated with each other (e.g., the less likely it is that computer support personnel can service adaptive computer technologies, the more desired it is for them to be able to do so). Table 17 also shows that all 12 paired t-tests comparing "actual" and "desired" situation means were significant. All of these show that "desired" scores are significantly greater than "actual" ones (e.g., the mean "actual situation" score for the item that deals with the presence of a specialist in adaptive computer technologies on campus is 3.06 while the mean for the "desired situation" score is 5.28). The most pronounced differences were on items related to support for adaptive computer technologies.

See Table 17 in Appendix A

- Individuals who provide disability related services to students with disabilities rated their actual situations as significantly worse than the desired situation
- "Actual" and "desired" situations were negatively related (i.e., the worse the actual situation, the more strongly desired the improvement)

What do individuals responsible for providing services to students with disabilities who have poor "actual situations" feel would be most helpful for them? To answer this question we divided the sample, based on their responses to the "actual" item, into those whose "actual situation" did or did not meet the needs of students with disabilities (i.e., score between 4 and 6 vs. score between 1 and 3). We then compared the scores of the 2 groups using independent t-tests. Means and test results presented in Table 18.

See Table 18 in Appendix A

The findings indicate that there are differences which are significant or approach significance on 10 of the 12 variables examined. These indicate that service providers whose existing conditions fail to meet the needs of students with disabilities wish to have the situation rectified.

In particular, those whose current situation fails to meet the needs of students with disabilities want:

- More funding for the institution's adaptive computer technologies
- More equipment available in specialized labs/centres
- More physical space for equipment
- A person to train students
- Equipment available in more general use computer labs
- Administration to react more positively concerning accessibility of computers on campus
- Computer support people to take responsibility for adaptive technologies
- To be consulted when computer infrastructure decisions are made
- To have a multidisciplinary advisory/steering committee dealing with adaptive computer technologies
- To have computer based teaching materials used by professors that are more accessible

In addition to comparing the means, it is also interesting to examine the proportion of individuals who feel that their "actual situation" on specific variables does or does not meet students' needs. In this regard it is noteworthy that, as can be seen in Table 19, there were similar percentages of respondents who indicated that their situation meets the computer related needs of their students on 5 of the 12 items. There were substantially more respondents who indicated that the needs of students were met when it came to 2 variables. On the remaining 5 items, substantially more respondents indicated that their situations did not meet the needs of their students.

See Table 19 in Appendix A

- **Adequate in meeting the needs of students**: substantially more respondents indicated that the computer related needs of students were met on the following 2 items:
  1. Availability of adaptive computer technologies in specialized labs/centres
  2. Administration reacts positively concerning accessibility of computers

- **Mediocre**: approximately 1/2 of respondents indicated that their situation meets the computer related needs of their students on the following 5 items:
  3. Funding for institution's adaptive computer technologies
  4. Physical space available for computer technologies
  5. Training for students on adaptive computer technologies
  6. Opportunities for employees to learn about adaptive technologies
  7. Computer support people can service adaptive technologies

- **Inadequate in meeting the needs of students**: substantially more respondents indicated that the computer related needs of students were not met on the following 5 items:
  8. Availability of adaptive computer technologies in general use computer labs
  9. Specialist in adaptive computer technologies on campus
  10. Consulted when computer infrastructure decisions are made
  11. Advisory/steering committee dealing with computer accessibility
  12. Computer based teaching materials used by professors are accessible

Examination of the proportion of individuals who felt that their "actual situation" on specific variables did or did not meet students' needs in anglophone and francophone colleges and universities is presented in Table 20. These indicate that participants in francophone institutions, both colleges and universities, were more satisfied than their anglophone counterparts on most of the variables examined. Anglophone universities were the least satisfied with their existing situations.

See Table 20 in Appendix A

- Service providers in francophone institutions were more satisfied than those from anglophone colleges with their institution's ability to meet the computer related needs of students with disabilities (i.e., they reported fewer problems)

Wish list of personnel who provide services to students with disabilities. It can be seen in Table 21 that, overall, disability service providers wish that students were better equipped and prepared for the postsecondary experience. For example, 3 of the 4 highest ranked items express the wish for students to be more knowledgeable computer users, for students to be able to get subsidized computer technologies for home use more easily; and for students to have better access to computers off campus. The next group of highly ranked items relate to the need for accessibility of computer based teaching materials used by professors and for support services.

- Wish that students were better equipped and prepared for the postsecondary experience with regard to computer and adaptive technology-knowledge and equipment
- Wish that computer based teaching materials used by professors were more accessible
- Wish for more computer support services

When only the responses of participants who felt that their current situation does not meet the needs of students with disabilities were considered, the top ranked item was the need for more favorable response from administration. The need for accessible materials from professors, for a person to train students, for more space for the equipment, for more professional development time and more funding top the list. Additional details are presented in Table 20.

- Those whose existing situations are poor in these areas wish for:
  1. More favorable responding from administration
  2. Accessible materials from professors
  3. A person to train students
  4. More space for the equipment
  5. More professional development time
  6. Better funding

To compare wish lists of anglophone and francophone service providers from colleges and universities a 2-way between groups MANOVA was performed on the 16 "desired situation" items. Table 22 shows that both main effects and the interaction were significant. Therefore, the MANOVA was followed by a series of 2-way ANOVAs (2 Institution (College/University) x 2 Language (Anglophone/Francophone)).

See Table 22 in Appendix A

Table 22 shows that the main effect of language was significant for all 16 variables. In all instances participants from anglophone institutions had higher scores than those from francophone institutions (i.e., anglophone service providers wanted more services/resources). The main effect of institution was significant on 8 comparisons and a 9th comparison approached significance. Here the results are inconsistent, with some comparisons showing colleges to have higher scores while others showing that universities have higher scores. This is explained, in part by the finding that 12 of the 16 interaction effects were significant while a 13th approached significance. These all show that while anglophone institutions had higher scores than francophone institutions, this is especially true of universities. Figure 5 presents these data most clearly.

See Figure 5 in Appendix B

- Service providers from anglophone universities wanted more services/resources related to computer access than those from francophone universities
- Anglophone and francophone colleges were similar to each other on this variable
- College service providers were more interested than university service providers in having more equipment available in specialized labs/centres

Because of discrepancies in language and institution type, Table 23 presents the wish lists of anglophone and francophone colleges and universities separately.

See Table 23 in Appendix A

Faculty And Staff With Disabilities

Participants responded to the following questions:

> *We are also interested in studying faculty, professionals and other employees at colleges and universities. To the best of your knowledge, how many employees with disabilities, including yourself if applicable, are there at your institution?* _____
>
> *If at least 1:*
> *a.* ____ *If they need computer-related services/accommodations, are you (your office/service) expected to provide these services to them? Yes/No*
>
> *If "no" to item "a":*
> *b.* ____ *If not you (your office/service), whom do you think does or is supposed to provide services if these are needed?*

Presence on campus. To study the presence of faculty and staff with disabilities at Canadian colleges and universities two variables were examined. First we obtained a frequency count of the number of employees in each institution. Institutions varied tremendously in size. Therefore, we also examined the ratio of number of employees with disabilities to the total student enrollment.

Only 106 disability service providers were able to answer the question about the number of individuals with disabilities employed on campus. It can be seen in Table 24 that there was an average of 13 employees with disabilities per institution reported (SD = 28). The range of scores was 0 to 200, with a median of 3 and a mode of 0. Comparable proportion data (i.e., number of employees with disabilities per 1000 students) are as follows. The range of scores is 0/1000 to 20/1000, with a mean of 2/1000, a median of 0.9/1000 and a mode of 0/1000 employees with disabilities. Data in Table 24 provide a breakdown of the number and proportion of employees with disabilities in the various provinces and territories of Canada. These indicate that the 2 provinces with the greatest proportion of employees with disabilities are New Brunswick (4/1000) and British Columbia (4/1000). Those with the lowest proportion are Québec (.6/1000) and Prince Edward Island (0/1000). Distance education institutions also fared poorly in this regard, with a proportion of only 1/1000.

See Table 24 in Appendix A

- Many individuals who provide disability related services to students with disabilities were unable to even estimate the number of employees with disabilities at their institution
- The most common response was 0 employees with disabilities at the respondent's institution, although the median was 3 and the mean was 13
- There were large discrepancies among institutions in the number of faculty and staff with disabilities, with a range of 0 to 200
- The proportion of employees with disabilities to overall student enrollment ranged from 0/1000 to 20/1000 with a mean of 2/1000, a median of 0.9/1000 and a mode of 0/1000
- New Brunswick and British Columbia had the largest proportion of faculty and staff with disabilities (4/1000)
- Québec (.6/1000) and Prince Edward Island (0/1000) had the lowest proportion
- Distance education institutions also had a low proportion: 1/1000

Data in Table 25 indicate that, as was the case for students with disabilities, both the number and the proportion of employees with disabilities in francophone institutions is significantly lower ($F(1,99)=9.95$, $p<.01$, and $F(1,99)=5.73$, $p<.05$, respectively). Neither the number nor the proportion of faculty and staff with disabilities in colleges and universities differed significantly. Nor were the interactions significant.

See Table 25 in Appendix A

- Both the number and the proportion of employees with disabilities in francophone institutions is significantly lower
- Colleges and universities do not differ significantly on either the number or the proportion of employees with disabilities

Who should provide computer related services/accommodations to faculty and staff with disabilities? It can be seen in Table 26 that although many individuals were uncertain about what would happen if an employee with a disability needed computer related services/accommodations, of those who were able to answer 23% indicated that they or their office would provide this. 77% indicated that this was not the case. The Chi Square test indicates no significant difference as a function of either language $X^2=.605$, p=ns, or institution, $X^2=.362$, p=ns.

See Table 26 in Appendix A

- Less than 1/4 of service providers indicated that the office for services to students with disabilities would provide computer related accommodations or services to faculty and staff with disabilities

So who, then, is expected to provide computer related services to employees with disabilities? 90 respondents provided 100 responses. These are detailed in Table 27 and indicate that the most frequently cited response (cited by 37 respondents) is "Human Resources." This is followed by the employee's department (cited by 13 respondents) or the employee himself or herself (cited by 10 respondents). Eight disability service providers did not know. Other responses noted by several (4 to 7 respondents) are: computer services; the institution's administration; an employment equity/human rights committee; rehabilitation services external to the institution; and occupational health and safety.

See Table 27 in Appendix A

- There is considerable confusion about who should provide computer related services to faculty and staff with disabilities
- The most popular response was Human Resources

DISCUSSION

Who Are They? Characteristics Of Individuals Who Provide Disability Related Services To Students With Disabilities

- Sex distribution for individuals responsible for providing services to students with disabilities: 2/3 females
- Service providers had, on average, between 9 and 10 years of experience providing services to students with disabilities, although there was great variability
- Males had more years of experience working with students with disabilities than females and anglophones had more experience than francophones
- Experience of college and university service providers did not differ significantly
- Generally, participants were not very knowledgeable about computer technologies for students with disabilities
- Francophone service providers were less knowledgeable than anglophone service providers
- There were no significant differences between males and females or between college and university based staff

Demographics. 2/3 of those responsible for providing disability related services to students on campus are women. Although there was great variability, service providers had, on average, between 9 and 10 years of experience providing services to students with disabilities. Males had more years of experience working with students with disabilities than females and anglophones had more experience than francophones. Experience of college and university service providers did not differ significantly.

Knowledge about computer technologies. Generally, participants were not very knowledgeable about computer technologies for students with disabilities. Francophone service providers were less knowledgeable than anglophone service providers, although there were no significant differences between males and females or between college and university based staff.

Expertise in the use and deployment of computer and adaptive computer technologies for students with disabilities is rapidly becoming a necessity in postsecondary education. This suggests that money and time need to be invested in professional development opportunities, especially in the francophone community.

Enrollment

Students registered to receive disability related services in Canada's colleges and universities.

- On average, depending on the method of calculation, between 2-1/2% and 3-1/2% of postsecondary students are registered with their institution to receive disability related services
- There is great variability both in the overall size of postsecondary institutions as well as in the number of students with disabilities they enroll
- 8% of postsecondary educational institutions had no students with disabilities
- Universities are, on average, approximately twice as large as colleges, yet they enroll similar numbers of students with disabilities (approximately 215)
- Larger proportions of college students are registered to receive disability related services from their institution than university students (i.e., approximately 3-3/4% to 4% vs. 1-1/2% to 2%)

Our data indicate great discrepancies among the 156 institutions surveyed in the percentages of students with disabilities registered to receive services. The mean varied between 2-1/2% and 3-1/2%, depending on the method of calculation (3.58% when calculating the mean of percentages and 2.50% when dividing the mean of the number of students with disabilities by the mean overall student enrollment). Proportions ranged from close to 0% to more than 35%. In most institutions, however, the percentage of students with disabilities was under 1%. In general, junior/community colleges had a higher percentage of students with disabilities (between 3-3/4% and 4-1/2%) than universities (between 1-1/2% and 2%). 8% of institutions had no students registered to receive disability related services. Neither overall size of the institution nor size of the town in which the institution is located was related to the percentage of students with disabilities.

Data on the number of students with disabilities on campus are affected by the definition of disability used, what question is asked, of whom it is asked, and how percentages are calculated. Most research is based on self-reports by probability samples. Estimates of the number of North American postsecondary students with some disability have ranged from 5% to 11%, with junior/community colleges having a larger proportion of students with disabilities than universities (CADSPPE, 1999; Henderson, 1999; Horn & Berktold, 1999; Greene & Zimbler, 1989; Disabled Students in Postsecondary Education, 1997). For example, the 1995-96 National Postsecondary Aid Study (cited by Horn & Berktold, 1999) indicates that approximately 6% of 21,000 American university undergraduates surveyed indicated that they had a disability. The 1994 freshman survey conducted by the Cooperative Institutional Research Program studied 237,777 students attending 461 American universities and 2 year colleges (Henderson, 1995). The 1998 freshman survey examined responses at 469 American colleges and universities. In both the 1994 and 1998 surveys, approximately 9% of students reported at least one disability (Henderson, 1995, 1999). Large scale American results also show that between 1996 and 1998, 72% of postsecondary educational institutions enrolled students with disabilities (Lewis, Farris, & Greene, 1999). Comparable data for Canadian institutions do not exist, although a recent survey indicates that 6% of junior/community college graduates and 4% of university graduates in 1995 indicated that they had a disability (Taillon & Paju, 2000).

When comparing our findings to those of American investigations it is important to note that we studied only institutions which had at least 1 student with a disability, and that our data reflect the number of students registered to receive disability related services from their institutions. Data about the number of students "known" to individuals who provide disability related services has been obtained in both Canadian and American studies. Our findings are surprisingly similar to these. For example, the mean number of full time students with disabilities reported by the service providers in Killean and Hubka's (1999) Canadian study was

163 (range: 0-1200). The overall full time enrollment for the same institutions was 7507 (range: 200-50,000). Dividing the number of students with disabilities by the overall enrollment yields 2.17%. American studies using similar methodologies also yield comparable percentages. For example, Lance's (1996) study of 87 campus based disability service providers showed a value of 2.15% (students with disabilities: M = 287, range: 10-2100; overall enrollment M = 13,361, range: 100-60,000). Similarly, a very recent investigation by Jackson et al. (2001) showed a value of 2.67% (students with disabilities: M=276, overall enrollment M = 10,329). Our data, when the percentage is calculated in the same way, shows that 2.50% of students are registered to receive services from their postsecondary institution (students with disabilities: M=215, overall enrollment M = 8606).

Our findings, as well as those of Canadians Killean & Hubka (1999), closely resemble those reported in the American Lance (1996) and Jackson et al. (2001) studies. Thus, the proportion of students with disabilities in American and Canadian postsecondary institutions appear to be similar. As noted earlier, large scale epidemiological self-report surveys show that the percentage of students with disabilities in American postsecondary institutions varies somewhere between 5% and 11%. Individuals who provide disability related services to students with disabilities report only 2% to 3%. Therefore, it seems safe to say that between 1/2 and 3/4 of students with disabilities do not register with their office for students with disabilities either in Canada or the United States. Thus, based on 1998-1999 enrollments in Canadian postsecondary education (Statistics Canada, 2001a, 2001b) we estimate that there are well over 100,000 students with disabilities currently enrolled in Canadian postsecondary education, although, only between 1/4 and 1/2 of them are registered to receive disability related services.

Anglophone and francophone colleges and universities in Canada's provinces and territories.

- The average percentage of postsecondary students with disabilities registered to receive disability related services varies from 1/2% to 6% in Canada's 10 provinces
- Québec has a substantially lower proportion of postsecondary students with disabilities than the other provinces
- On average, Québec colleges are relatively smaller and Québec universities are relatively larger than their counterparts in the rest of Canada
- Overall postsecondary enrollment in Québec and the rest of Canada do not differ
- The mean number of students with disabilities enrolled in postsecondary educational institutions is lower in Québec than in the rest of Canada
- Québec has a smaller proportion of students with disabilities both at the college (0.6% vs. 6%) and university levels (0.4% vs. 3%), with the difference being greatest in colleges
- The proportion of students with disabilities is significantly and negatively related to total overall enrollment (i.e., larger institutions have a smaller proportion of students with disabilities), but only in anglophone colleges and universities

Linguistic differences across Canada.

- Overall mean enrollment in francophone and anglophone educational institutions is similar
- The average number of students with disabilities enrolled in francophone postsecondary educational institutions is lower than that in anglophone institutions
- Smaller proportion of francophone than anglophone postsecondary students are registered to receive disability related services from their postsecondary institution
- There is no way to unconfound province of origin and language because most francophone institutions are located in Québec and most anglophone institutions are located in the other provinces
- Francophone colleges in Québec are larger than francophone colleges outside Québec
- No difference in number of students with disabilities enrolled in francophone colleges inside and outside Québec
- Québec francophone colleges have a smaller proportion of students with disabilities than francophone colleges outside Québec (0.6% vs. 5%)
- On average, both anglophone and francophone universities in Québec are larger than those in the rest of Canada
- Anglophone colleges in Québec and the rest of Canada are similar in size
- Location in Québec and speaking French are both related to the lower percentage of students with disabilities, with both province and language having independent effects
- Regardless of language or college or university status, the proportion of students with disabilities in Québec institutions is substantially lower

Our results show that there is a smaller proportion of students with disabilities in Québec colleges and universities than in comparable institutions in the rest of Canada. Analyses which attempted to unconfound language and province factors were only partially successful in answering the question, "Is the difference due to language or to differences in provincial policies?" This was because of the limited number of anglophone institutions inside Québec and the limited number of francophone institutions outside Québec. The closest approximation to an answer than we can propose is that most of the difference is due to provincial policies and practices, with a smaller but independent role for language.

To explain the huge discrepancies between Québec and the rest of Canada we examined – and rejected - five hypotheses related to demographic factors and the nature of postsecondary education in Québec and the rest of Canada

Hypothesis 1: The reason for the discrepancy is that Québec's colleges are more "academic" than those in the rest of Canada (i.e., the 2 year "pre-university" college programs are the equivalent of the first year of university in most other provinces and the 3 year "career" programs contain substantial academic content). In addition, attending a college in the rest of Canada is generally based on a choice between university or college. Students attend a college if they need to upgrade their skills, wish to take a college program instead of a university program, or take university transfer credits when there is no university close by. Those who wish to go straight into a university program. In Québec most students have to attend college if they wish to go to university. Although all of these differences are generally true, both our current data set as well as our previous results (Fichten, Barile, & Asuncion, 1999a) have shown that the discrepancies between Québec and the rest of Canada in the percentage of students with disabilities is are also true at the university level, and that the "academic" orientation of Québec colleges does not account for the low numbers. Moreover, in the present

investigation we categorized "university colleges" outside Québec as colleges. These university/colleges offer courses that are accepted for credit in many university degree programs.

Hypothesis 2: Another possibility was that Québec simply does not value education for its population the way other provinces do. This, hypothesis, too, was rejected because, if anything, Québec is slightly ahead of the rest of Canada in stressing education for its population. For example, according to Statistics Canada (2000a), in 1999 Québec accounted for 24% of the population. Yet, in 1996-97 Québec accounted for 32% of full and part time college students (Statistics Canada, 2000b), and 28% of full and part time university students Statistics Canada (2000c).

Hypothesis 3: Our data show that colleges outside Québec tend to be substantially larger than colleges in Québec. Larger institutions have more students, both with and without disabilities, and, therefore, a more formalized approach to the delivery of disability related services. This includes a well established office for students with disabilities or the presence on campus of a person whose job function is providing disability related services. This is in contrast to smaller colleges where the individual who provides disability related services also has other responsibilities. With this comes a more formalized approach to registering and recognizing students with disabilities on campus. So, according to this hypothesis, individuals responsible for providing services to college students with disabilities in other provinces may have more sophisticated "accounting" systems for keeping records on students with disabilities and a more comprehensive view of what constitutes a "disability." This hypothesis, too, was rejected because the percentage of students with disabilities is substantially lower in Québec universities as well, even though these institutions tend to be larger than their Canadian counterparts. Indeed, the low enrollment of students with disabilities in Québec postsecondary institutions has been lamented by a variety of sources in Québec (Allie & Hébert, 1998; AQEHPS, 1999; OPHQ, 1995).

Hypothesis 4: The population of persons with disabilities in Québec is lower than the rest of Canada; therefore the discrepancy in student enrollments simply reflects the distribution in the general population. In 1991 the percentage of persons with disabilities in Québec was slightly lower (14%) than in the rest of Canada (18%) (Statistics Canada, 2000d, 2000e, 2000e). However, the magnitude of the difference is not comparable to the difference found for postsecondary students.

Hypothesis 5: One possibility was that the differences are due to linguistic variables. As noted by others, there are numerous differences in the postsecondary education of Québec anglophones and francophones (cf. Butlin, 1999; Norris, 1999). Our findings indicate that language is an important variable in the Québec context (i.e., there is a larger proportion of students in anglophone (approximately 1%) than francophone colleges (approximately 1/2%), as well as universities (0.2% vs. 1-1/2%, respectively). The same is true, but to a much lesser extent, in the rest of Canada (college: 5% vs. 5-3/4%, university 1/2 % vs. 2-3/4%). Nevertheless, neither anglophone nor francophone colleges or universities in Québec approach their counterparts in the rest of Canada. This leads us to conclude that it is not primarily language that is the determining factor, but, rather, some other systemic differences in the ways of conceptualizing and dealing with individuals with disabilities in Québec and the rest of Canada (cf. Fougeyrollas, Cloutier, Bergeron, Coté, & St. Michel, 1998; Lemieux-Brassard, 2000).

***Hypothesis 6*:** This hypothesis, which is related to what disabilities are officially "recognized" in Québec and in the other Canadian provinces has some merit. Nevertheless, it fails to account for the magnitude of the difference between Québec and the rest of Canada. Students with learning disabilities, who typically make up about 1/3 to 1/2 of North American institutions' populations of students with disabilities (e.g., Fichten, C.S. et al., 1999a; Jackson et al., 2001; Roessler & Kirk, 1998; Scott, 1997), are not considered to have a disability in Québec. Among francophones, in particular, learning disability as a clinical entity is only now being contemplated (Cardyn & Bégin, 1998). Thus, Québec enrollments, especially in francophone institutions, exclude the 1/3 to 1/2 of postsecondary students with disabilities who probably have a learning disability. To evaluate this possibility in a previous investigation of Québec colleges (Fichten, Barile, Robillard, Fossey, Asuncion, Généreux, Judd, & Guimont, 2000) we conducted a series of comparisons where we controlled for learning disabilities by subtracting 1/3 of the students with disabilities in anglophone colleges, as this is the proportion of students with disabilities who generally have a learning disability. While this mitigated the differences somewhat, the correction by no means diminished the very large discrepancies. Moreover, in the current investigation anglophone colleges and universities in Québec indicated that they had large numbers of students with learning disabilities who received disability related services such as tutoring, extra time for exams, etc. Nevertheless, the difference between anglophone colleges and universities in Québec and their counterparts outside Québec continue to show very substantial differences. This is considerably greater that the 1/3 to 1/2 of students with disabilities that can be reasonably assumed to be students with a learning disability.

We do not understand the reasons for the linguistic differences within Québec, as we have found that neither institution size, nor institution location are related significantly to the percentage of students with disabilities in francophone institutions. Indeed, we found no significant correlations with the percentage of students with disabilities on any of the variables examined.

Actual Situation Of Computers On Canadian Campuses

Institutions with and without computer and adaptive computer technologies on campus for students with disabilities.

- Most institutions had computer equipment for their students with disabilities
- There were no significant differences between anglophone and francophone institutions
- Colleges were less likely than universities to have computers for their students with disabilities
- Although there was a suggestion that colleges with equipment for their students with disabilities had larger numbers of students with disabilities enrolled in their programs than colleges with no equipment, the relationship was not significant

In previous research we showed that close to 1/2 of postsecondary students with disabilities need some type of adaptation to use a computer effectively (e.g., keyboard and input device modifications, screen magnification or voice output. dictation software) (Fichten, Barile, & Asuncion, 1999a). Given the large numbers of students needing adaptations, it was not surprising to find that most institutions (86%) had some specialized computer equipment for students with disabilities on campus. This is markedly different from American data collected in the late 1980s and early 1990s which showed that only 60% to 70% of institutions provided computer equipment for their students with disabilities (Burgstahler, 1992, 1993; Horn & Shell, 1990).

Virtually all universities had equipment. But the data show that colleges were significantly less likely to have equipment for their students with disabilities than universities. The main difference between the 82% of colleges which had some type of computer or adaptive computer technologies for their students and the 18% that did not was size. Colleges with equipment tended to be larger, to have more students with disabilities, and to have a larger percentage of students with disabilities. Anglophone and francophone institutions did not differ in this regard. Nevertheless, it should be noted that consistent with population wide studies in Canada, whatever differences there were favored anglophone institutions (i.e., more extensive and broader based use of information, computer and adaptive computer technologies on English campuses). These differences, like their population counterparts, however, were neither substantial nor significant (Angus Reid Group, 2000; Labrèche, 2000; PricewaterhouseCoopers, 2000; Statistics Canada, 1999).

Multidisciplinary advisory/steering committee which deals with the accessibility of computer technologies for students with disabilities.

- Less than 1/4 of institutions had had a multidisciplinary advisory/steering committee which deals with the accessibility of computer technologies for students with disabilities
- Universities were somewhat more likely than colleges to have an advisory/steering committee which deals with the accessibility of computer technologies for students with disabilities
- Advisory/steering committees generally had at least one representative of the office for students with disabilities, the administration, students with disabilities, and the faculty
- Only 1/4 of committees had computer services staff representation

It is important to note that less than 1/4 of institutions had a multidisciplinary advisory/steering committee which deals with the accessibility of computer technologies for students with disabilities. Universities were somewhat more likely than colleges to have an advisory/steering committee. 34% of universities had such a committee, while only 17% of colleges did so. Neither distance education institution had a committee. Linguistic differences favored anglophone institutions, although the differences were not significant.

Advisory/steering committees generally had at least one representative of the office for students with disabilities, the administration, students with disabilities, and the faculty. Only 1/4 of committees had computer services staff representation, however. This is similar to American findings from the early 1990s (Burgstahler, 1992, 1993), where only about 1/3 of higher education institutions made decisions after formal broad-based consultation (i.e., intersectorial committees including students, computing services, audio-visual, the library, learning center, physical plant representatives, faculty, student affairs, and adaptive technologists). With the increased use of computer technologies in the delivery of postsecondary education, this is an important area where broader consultation will be needed. In the future, it will become necessary to ensure that course and department web pages, WebCT or other web authoring tools, software loaded onto networks, educational CD-ROMs and other software based tutorials developed and purchased by postsecondary institutions meet accessible and inclusive design guidelines and are compatible with adaptive technologies.

If IT continues to be an important priority, then having these types of committees with the necessary mix of expertise is vital to ensure that specific disability related concerns can be addressed. This would also provide a more prominent role for computer adaptations for students with disabilities and go a long way toward ensuring that disability support professionals are consulted when campus wide computer infrastructure decisions are made.

Priority placed upon computer related services.

- Postsecondary institutions generally accorded moderate priority to computer related services
- Universities accorded somewhat higher priority to computer related services than colleges
- There were no differences based on language

In general, computer related services constituted a moderately important priority within the totality of services offered to students with disabilities. Universities accorded somewhat higher priority to computer related services than colleges. In the future we expect this function to gain in importance as all postsecondary institutions proceed along the road to greater integration of computer technologies across the curriculum.

Provincial/regional computer technology loan programs to institutions.

- Only slightly more than 1/3 of institutions had a provincial/regional loan program which supplied some of their computer and/or adaptive computer technologies
- In general, these loan programs were viewed very positively in meeting students' needs

An important finding concerns the strong satisfaction expressed by service providers about the equipment and responsiveness of the centralized loan banks for computer technologies. Thirty-five percent of institutions indicated that a provincial/regional loan program supplied some of the computer and/or adaptive computer technologies on campus. There was no significant difference on this variable between colleges and universities or between anglophone or francophone institutions. Indeed, only 16% of respondents who had access to a loan bank indicated that the equipment provided failed to meet students' needs.

Good Institutional Computer And Adaptive Computer Technologies

- The computer related needs of students were moderately well met at their institutions
- This was true for both anglophone and francophone colleges and universities
- Size of the institution, the number and the proportion of students with disabilities were unrelated to overall adequacy in meeting students' computer and adaptive computer technology needs
- On the overall evaluation about how well students' computer related needs are met there was no significant difference between institutions that did and those that did not have equipment on campus for their students with disabilities

Overall, responses of individuals who provide disability related services to students with disabilities indicate that the computer related needs of students with disabilities are moderately well met at their institutions. This was true for both anglophone and francophone colleges and universities. Neither the size of the institution nor the number or proportion of students with disabilities were related to overall adequacy in meeting students' computer and adaptive computer technology needs.

It was counterintuitive to find that how well students' computer related needs were met was unrelated to presence of computers on campus. Nevertheless, similar findings have been reported by others (e.g., Lance, 1996). Before examining different possible explanations it should be noted that it was primarily colleges with low enrollments of students with disabilities that were likely to have no equipment on campus for their students. The lack of correspondence between the availability of computer, information and adaptive technologies and the ability of the institution to met the computer related needs of students with disabilities may reflect three possibilities. First, students on campuses with no equipment may not need any specialized adaptive computer technologies because using computers on campus is not required by students' programs. Second, it is feasible that many students are able to use the unadapted equipment available in the college's general use computer labs. The third possibility is that students are able to cope with extensive human assistance on campus and with their own equipment which allows them to function well in the context of their on-campus activities.

We do not have any data bearing directly on this issue. The findings of our previous investigations (Fichten, Barile, & Asuncion, 1999a) do suggest, however, that it is a combination of all three possibilities that best explain the findings. First, most students with disabilities are enrolled in social sciences and creative arts programs, which do not yet use computer technologies in sophisticated ways. Second, data from our previous investigations indicate that somewhat less than 1/2 of students need adaptations to use a computer effectively. Third, our findings indicate that most students have computer equipment available to them off campus. Anecdotal information from our respondents suggest that in smaller colleges, service providers are able to make available human assistance to students (e.g., have an assistant read material for students with print impairments, arrange for a scribe or a note taker to assist students with writing).

Campus based disability service providers at smaller colleges and campuses which have little or no computer equipment or support for their students with disabilities have felt that the lack of equipment has not posed significant problems because enrollments are still low enough so that human assistance is available instead of technological adaptations (Fichten, Asuncion, Fossey, Robillard, Barile, 2001). Thus, service providers in smaller colleges may have been proceeding with an individualized, case-by-case approach. More students with disabilities are enrolling all the time and there is a strong trend to greater integration of computer technologies across the curriculum. Campuses currently not offering computer supports for their students with disabilities need to carefully and continually examine this situation. With growing enrollment figures and rapid deployment of computer technologies across the curriculum, we expect increased demand for computer and computer adaptive technologies for students with disabilities on campus.

Evaluation Criteria: Aspects Important In Meeting The Computer Related Needs Of Students With Disabilities

The presence of computer equipment on campus for students with disabilities, per se, was not important in meeting the computer related needs of students. On campuses where equipment was available, however, the following factors were deemed important in ensuring that the institution is technologically welcoming to its students with disabilities.

1. **Sufficient funding for computer and adaptive computer technologies.**

2. **Adequate training opportunities for students from agencies in the community.**

3. **Good access to adaptive computer technologies on campus.**
   - Computer and adaptive computer technologies that are up-to-date and available in both general use computer labs and specialized labs/centres
   - The existence of an off-campus computer technology loan program
   - Availability of training for students on adaptive computer technologies
   - Adequate physical space to house computer technologies
   - Extensive hours of access to computers, including adapted computer technologies

4. **Availability of support for adaptive computer technologies on campus.**
   - Good technical support for adaptive computer technologies on campus
   - Opportunities for employees to learn about adaptive technologies
   - Favorable reactions for administration concerning the accessibility of computers
   - Expertise with adaptive computer technologies of disability service providers

5. **Accessible computer based teaching materials used by professors**

6. **Accessibility of the internet, online education and the library.**
   - Availability of sufficient numbers of adapted computers with internet access
   - Library computers that are accessible to students with a variety of impairments
   - internet-based distance education that has been designed to be accessible to students with disabilities

Report Card: Adequacy Of Aspects Of Computer Technologies On Campus In Meeting The Needs Of Students With Disabilities

In general, the responses indicated that the overall computer related needs of students with disabilities on campus were reasonably well met. This is similar to ratings in others' studies (e.g., Burris, 1998). There were relatively few differences between colleges and universities, although where institutional differences did exist, ratings at universities were generally more favorable than those at colleges. There were many linguistic differences. Ratings about the adequacy of computer related services at francophone institutions were generally more favorable than those at anglophone institutions. There were areas of strength and weakness for both colleges and universities.

Areas of strength.

- Hours of access to computers and the extent to which they were up-to-date
- Administrations generally respond favorably when it comes to issues related to the accessibility of computers for students with disabilities
- Community agencies provided students with appropriate equipment

Participants felt that college administrations were supportive of the computer related concerns of students with disabilities. Yet, there was a suggestion that this support may not extend to good funding. A common comment was "they are certainly supportive in words, but in terms of being proactive, and putting money where their mouths were, that was a totally different issue." For example, the rating concerning the adequacy of the current state of funding received a score below 4 on a 6 point scale and additional funding for computer and adaptive computer technologies was a highly rated item on service providers' wish lists.

Problem areas.

- Poor technical support for adapted computer technologies
- Inadequate availability of adaptive computer technologies in general use computer laboratories and lack of physical space for adapted computers in specialized labs/centers
- No off campus computer technology loan program for students
- Few opportunities for employees to learn about computer and adaptive technologies
- Lack of consultation of disability service providers when campus-wide computer infrastructure decisions are made
- Absence of multisectorial advisory/steering committees to deal with computer accessibility
- Inaccessible internet based distance education courses
- Computer based teaching materials used by faculty are frequently inaccessible and faculty are not informed about computer related needs of students with disabilities
- Community agencies do not provide adequate training for students using adaptive technologies

Overall, ratings related to support for computer and adaptive computer technologies for students with disabilities were generally poor as was the overall level of interdepartmental collaboration. Also, many noted a lack of awareness by faculty regarding computer related problems. For example, in training programs aimed at promoting the educational use of computer technologies by faculty, issues related to accessibility for students with disabilities are generally not discussed. An anecdotal example that highlights this is that one of us was told, while taking a seminar on how to develop course related web pages, that students who are blind cannot use a computer because they cannot see the screen.

Wish Lists

- That students were better equipped and prepared for the postsecondary experience with regard to computer and adaptive technology-knowledge and equipment
- That computer based teaching materials used by professors were more accessible
- More computer support services
- Service providers from anglophone universities wanted more services/resources than those from francophone universities (no difference between college personnel)
- College service providers were more interested than university service providers in having more equipment available in specialized labs/centres

Those whose existing situations were poor in these areas wished for:

- More favorable action from administration
- Accessible computer based materials from professors
- A person to train students
- More space for the equipment
- More professional development time
- Better funding

Examination of the wish lists of individuals responsible for providing services to students with disabilities showed, not surprisingly, that desired items followed low ratings concerning the institution's actual situation. In particular, disability service providers indicated that their jobs would be easier to carry out if students were better equipped and prepared for the computer related aspects of the college experience. For example, 3 of the 4 most highly ranked items express the wish for students to be able to get subsidized computer technologies for home use more easily, for students to have better access to computers off campus, and for students to be more knowledgeable computer users.

The next group of highly ranked items relates to technical and financial support and includes having the institution's computer support people take more responsibility for adaptive computer equipment, the availability of an adaptive computer specialist, as well as better funding for computer related activities and more space for equipment. They also wanted to be consulted when computer related campus wide infrastructure decisions are made and they wanted professional development time to learn about adaptive computer technologies.

Last but not least, individuals who provide disability related services to students with disabilities also wished that technology based teaching materials and techniques used by faculty were more accessible.
As noted earlier, service providers from francophone institutions were more satisfied with computer supports for their students with disabilities than were anglophone service providers. Thus, it was not surprising to find that service providers from anglophone universities wanted more services/resources related to computer access than those from francophone universities. Although anglophone and francophone colleges were similar to each other on this variable, college service providers were more interested than university service providers in having more equipment available in specialized labs/centres.

Faculty and Staff With Disabilities

Presence on campus.

- Many individuals who provide disability related services to students with disabilities were unable to even estimate the number of employees with disabilities at their institution
- The most common response was 0 employees with disabilities at the respondent's institution, although the median was 3 and the mean was 13
- There were large discrepancies among institutions in the number of employees with disabilities, with a range of 0 to 200
- The proportion of employees with disabilities to overall student enrollment ranged from 0/1000 to 20/1000 with a mean of 2/1000, a median of 0.9/1000 and a mode of 0/1000
- New Brunswick and British Columbia had the largest proportion of employees with disabilities
- Québec and Prince Edward Island had the lowest proportion
- Distance education institutions also had a low proportion
- Both the number and the proportion of employees with disabilities in francophone institutions was significantly lower
- Colleges and universities did not differ significantly on either the number or the proportion of employees with disabilities

Many individuals who provide disability related services to students with disabilities were unable to even estimate the number of employees with disabilities at their institution. When responses were provided, the most common response was 0 employees with disabilities at the respondent's institution. The median response was 3 individuals and the mean was 13. There were large discrepancies among institutions in the number of employees with disabilities, with a range of 0 to 200. The 2 provinces with the greatest proportion of employees with disabilities to overall student enrollment were New Brunswick and British Columbia. Distance education institutions and Québec and Prince Edward Island had the lowest proportions. Colleges and universities did not differ significantly on either the number or the proportion of employees with disabilities.

Who should provide computer related services/accommodations to faculty and staff with disabilities?

- Less than 1/4 of service providers indicated that the office for services to students with disabilities would provide computer related accommodations or services to faculty and staff with disabilities
- There is considerable confusion about who should provide computer related services to employees
- The most popular response was Human Resources

When we asked about who would provide computer related accommodations or services to faculty and staff with disabilities less than 1/4 of service providers indicated that they or the office for services to students with disabilities would do so. So if not them, then who? Here, considerable confusion existed about who should provide computer related services to employees with disabilities. The most popular response (37% of responses) was Human Resources. This was followed by the employee's department. (13% of responses). It was especially dismaying to find that the next most popular category was that the employee himself or herself was responsible (10%) or that the respondent simply did not have any ideas about who should provide computer related services to employees with disabilities (8%). This is an issue that will clearly have to be addressed in the near future.

Needs And Concerns Of Students With Disabilities

Results from both our current research as well as from our companion study for the Office of learning technologies where the focus was on students with disabilities (Fichten, Barile, & Asuncion, 1999a) converge on a variety of important points. First, it is evident that computer technologies have incredible potential to facilitate the academic endeavors of students with all types of disabilities. Second, it is also clear that while the perceived advantages of computer technologies far outweighed the disadvantages, these technologies can act as either obstacles or facilitators for students with disabilities. Postsecondary students with disabilities appear to have a high level of computer and internet use and literacy. In fact, most participants in our previous research indicated that more, more up-to-date, better, and more user friendly technologies are needed both by students with disabilities as well as by institutions enrolling students with disabilities. What is also readily apparent from the data is that there are a variety of problems and issues regarding the availability of such technologies which need to be addressed. These include concern over inadequate funding for computer and adaptive computer technologies, both for the students themselves and for the institutions; lack of information about existing subsidy programs to help students acquire computer technologies; better campus based technical support, the need for more information about adaptive technologies and enhanced training opportunities for students, individuals responsible for providing services to postsecondary students with disabilities as well as for faculty and computer services staff.

Our previous work (Fichten, Barile, & Asuncion, 1999a) also underscores the need for adapted work stations which accommodate the needs of students with various impairments and highlight the increasing importance of ensuring that different types of adaptive equipment be able to work together. In particular, the video card requirements of magnification software, the heavy hardware and training demands of voice recognition programs, and compatibility between dictation software and voice technologies that read what is on the screen should be taken into consideration. Consistent with this trend is the "cross-use" of adaptive technologies by students with different disabilities (i.e., for students with one kind of impairment to use technologies intended for students with a different type of disability).

Limitations Of The Research

We were fortunate to obtain the participation of 156 individuals who provide disability related services to students. This represents an 80% participation rate and a sample that is representative of the geographic, linguistic and institutional characteristics of the Canadian postsecondary educational system. Nevertheless, there are limitations that should be kept in mind when interpreting the findings.

First, the majority of our participants admitted to having limited knowledge of adaptive and computer based learning technologies. Therefore, we can not be certain about how they interpreted certain concepts (e.g., computer-based teaching materials). A related problem involves interpretation of the term "accessibility" because this word can have multiple meanings (e.g., available vs. usable by students with different impairments). When asked, we clarified what we meant. Nevertheless, we cannot be certain that all participants understood all questions as we intended them. In some cases, linguistic interpretation and context also may have led to misunderstandings. Also, some participants consulted their institution's adaptive technology expert. Most did not. This, too, could have influenced the findings.

A second concern relates to problems respondents had answering questions about the number of students on campus: both the question about the number of students with disabilities as well as the one about overall campus enrollment. This occurred because there are many different categories of students: full-time, day, evening, continuing education, etc.

Yet, those validly indices which are available suggest that the responses in our study accurately reflect the situation of individuals who provide disability related services to students with disabilities. Wherever comparisons were possible, either with American data or with Canadian data from smaller samples, the results show remarkable consistencies. This is true of the number and the proportion of students registered to receive disability related services on campus, overall institutional enrollments, and the nature of issues and concerns raised by the participants. In spite of these favorable check son ecological validity, the limitations need to be taken into consideration.

RECOMMENDATIONS

Recommendations For Individuals Responsible For Providing Services To Students With Disabilities

Ensure, through ongoing evaluation of the current situation on campus, that the minimal criteria for technology access are met. In reviewing institutional information technology services, Wasser (1998) refers to six important criteria for good technology access in postsecondary institutions. These are the same criteria that need to be considered when providing services to students with disabilities in addition to criteria found in the present investigation to be important in meeting the needs of students with disabilities. These are listed below. It is important to impress upon all levels of administration that it is vital that these goals are met.

Wasser's (1998) important criteria for good technology access (italics ours):

- Access to the institution's systems and the internet from a variety of locations at various times of day
- Training on computers and the internet
- Technical support when and where students are using computers
- Digital libraries which provide on-line access to catalogues and electronic texts
- Faculty support and training *on integrating universal design of technology into courses*
- Responsiveness to the needs of the community (e.g., on-line application, e-mail, course and institutional information on the web *in accessible formats*)

Criteria deemed important by individuals who provide disability related services to students with disabilities:

- Funding for computer and adaptive computer technologies.
- Adequate training opportunities for students from agencies in the community.
- Good access to adaptive computer technologies on campus.
- Availability of support for adaptive computer technologies on campus.
- Accessible computer based teaching materials used by professors
- Accessibility of the internet, online education and the library.

Make computer and adaptive computer technologies for students with disabilities known and available on your campus. Some institutions, especially smaller colleges and campuses, have little or no computer equipment or support for their students with disabilities. To date, campus based disability service providers have felt that this has not posed significant problems because enrollments are still low enough so that human assistance is available instead of technological adaptations (Fichten, Asuncion, Fossey, Robillard, Barile, 2001). Thus, service providers in smaller institutions have been proceeding with an individualised, case-by-case approach. In this regard, however, it should be noted that Paul Grossman, in recapping a recent landmark decision by the U.S. Department of Education's Office for Civil Rights, noted that providing human assistance in lieu of making computer adaptations available was not an appropriate accommodation (Hamilton, Grossman, Black, & Tate, 2001). This is because human assistance does not afford students with disabilities the same opportunities as those available to their nondisabled peers. For example, assistance is available only when the human assistant is available, there is a loss of autonomy, skills needed to function in the academic environment are not learned. In the near future, all campuses will need to make computer technologies available to meet the needs of students with disabilities.

Provide off-hours access to computer technologies and arrange to loan computer technologies to students. Most students have academic work schedules that differ from those of the traditional "nine to five" working day (e.g., writing and doing research during the evenings and weekends). Some students also have transportation and health concerns (e.g., fluctuating levels of energy during the day, restrictive schedules of adaptive transportation). These make it critical that students with disabilities be given as much, if not more, access at school to computer technologies as their nondisabled counterparts receive. This is especially important in rural and outlying regions.

At many colleges and universities, general use computer labs and libraries have extended evening and weekend hours to meet the needs of their students. In recognition of this reality, and keeping in mind that some students with disabilities have no up-to-date equipment of their own to use off campus, individuals responsible for providing services to students with disabilities need to develop creative solutions to allow students to use adaptive computer equipment where it is currently housed (e.g., have students turn in their ID cards at security, have them "sign in," install a key card system). An alternative is to move computer equipment out of restrictive "nine to five" locations into less limiting ones, such as general use computer labs or libraries.

In cases where this is not possible the institution may wish to develop a program to loan equipment to students. For example, students could benefit from being able to use laptops to work on assignments between classes, to take their own notes in class, give presentations, work in groups or communicate with other students. Such technological solutions could not only benefit students but could also be cost-effective.

Regularly inform students with disabilities about what is available to them on campus. If equipment is to be used, students with disabilities need to be made aware of its existence. At the start of every semester, new and old students alike should be acquainted with the types of technological supports available to them, where these can be found, and when they can be used. It is important to remember that some students with disabilities have little contact with service providers. Therefore, "open house" or other campus wide publicity, in adapted formats, may be useful. As part of a web page on existing disability-related services, or printed literature, a listing of available computer equipment and hours of access could be provided. In the latter case, this needs to be provided in an alternative formats.

There is sometimes an assumption that only certain students with disabilities will benefit from specific pieces of hardware or software. However as both the literature (e.g., Elkind, 1998; HEATH, 1999) and our own data show, students with disabilities do, in fact, "cross-use" technology. For example, students who are blind and those with specific learning disabilities both reported using screen readers. Rather than assume or prescribe computer supports for students, students must be allowed to choose for themselves the types of computer supports that might work best for them. Indeed, allowing students to become familiar with the types of equipment available and to try out new types of technologies may result in creative solutions to students' computing problems.

Educate professors about the importance of ensuring accessibility in their courses and advocate for discussion of accessibility during faculty training workshops on technology integration in the classroom. While it is by no means clear that computer based learning is superior to traditional delivery of education, what is evident is that in the foreseeable future it is not only here to stay but will proliferate. Many faculty are scrambling to learn the basic skills needed to function given the new realities (cf. UCLA Graduate School of Education & Information Studies, 1999). Given a general lack of sophistication, it should come as no surprise

that professors generally don't know what kinds of things to do to ensure that students with disabilities have full access to their electronic course materials (cf. Roessler & Kirk, 1998). For example, that Adobe Acrobat PDF files can have problems with accessibility for students with print and visual impairments, that PowerPoint is problematic for some students with visual impairments, that text (.txt) versions that work in Windows don't necessarily work in a DOS environment, that students with hearing impairments will probably miss audio clips on web pages and CD-ROMs, that some students have problems in computer labs when using a mouse, etc. (cf. Banks & Coombs, 1998). They simply do not think of these issues when they are developing their courses. This is especially true of online and web based distance education.

Many postsecondary institutions offer workshops, courses, or training programs for faculty to assist them in integrating learning and instructional technologies into their courses. Discussion of adaptive computer technologies rarely form part of such activities. Dialogue with those who plan and teach such courses and workshops, including offering to guest lecture on the topic of accessibility, can go a long way toward ensuring that faculty are aware of the computer needs of all of their students.

Other possibilities include holding a workshop or open house for professors concerning making electronic course materials accessible and useful for all of their students. Inviting sophisticated computer user students with different disabilities is likely to help drive the important points home. Inserting a module on issues related to students with disabilities into professional development and in-service training aimed at faculty preparing to integrate technology into their teaching is also critical. Of course, providing support for faculty in actually implementing needed changes is also important.

Making material available in an electronic format, whether it be by placing it online or on computer disk is an example of an adaptation, as is encouraging the use of e-mail in place of face-to-face office hours for those students who can not make it to the institution due to their disability.

Personnel responsible for providing services to students with disabilities can often advise professors about what kinds of problems exist and what kinds of solutions are available. Also, as noted earlier, some students themselves often know a great deal about what kinds of technologies are helpful. For those professors who are interested in "readable," minimally technical presentations, two resources are likely to be of interest: "W3C Checkpoints" by Chisholm et al. (1999) and "Universal design of a web site" by Cooper (1999). In addition, there are excellent "user-friendly" suggestions made by Burgstahler (1998), Campbell and Waddell (1997), and DO-IT (2001).

Make training a priority both for students and postsecondary personnel. Lack of knowledge about how to use specialized computer technologies on the part of both students and staff who oversee the technology is an important concern. If it is to be used effectively, systematic training must be seen as part of the overall investment in the equipment itself.

Some students are intimidated by computer technologies. Others are not given the appropriate support to use it to its optimum. Rectifying this situation starts with having knowledgeable staff at the school who know how to use the equipment. Where offices responsible for providing services to students with disabilities have adaptive technology "specialists" or technicians responsible for overseeing the equipment, time and opportunities must be provided to allow them to learn to use the technologies. Periodic "in-service" workshops, demos by students or colleagues from neighboring universities and colleges, professionals, or representatives of adaptive technology organizations and companies can provide a change of pace as well as information. Some vendors

of adaptive computer technologies will "loan" their products on consignment to colleges and universities for evaluation and many software products have downloadable trial or demonstrative versions. Whether it is providing educational opportunities or allotting time to allow staff to learn on their own, learning about adaptive computer technologies needs to take place.

Where adaptive technologies are located at various locations and at different campuses, other staff (e.g., library staff, staff in computer labs) need to receive at least minimal training to enable them to assist students. Then, and only then, can students with disabilities themselves be adequately trained.

Many institutions offer students one day or half day workshops and hand-outs on the use of campus computer facilities. The same must hold true for students with disabilities. This doesn't have to be an expensive undertaking. Some students on campus have probably developed expertise in the use of specific hardware or software. By using a mentoring approach, these sophisticated students can be paired with other students who could benefit from their help. It makes sense that if there is equipment on campus, it is the responsibility of the institution to ensure that appropriate training takes place so that students can use the equipment. Putting a bunch of PCs in classrooms without offering students and faculty instruction in how to operate the equipment makes little sense for postsecondary institutions. The same goes for computer equipment for students with disabilities.

Include students with disabilities in all computer, learning, and adaptive computer technology acquisition decisions. To ensure that the computer technologies purchased will actually be used by students, it is vital that students with disabilities be included in the decision making process. This is particularly important since our findings indicate that needs and concerns of personnel responsible for providing services to students with disabilities are sometimes different from those of the students (Fichten, et al., in press, Study 2). Because of the nature of their tasks, issues that are important to service providers frequently relate to institutional concerns, budgets, relations with other sectors of the institution, etc. Both student and service provider perspectives are valuable, and students can be involved in the decision making process whether the institution has a formal or an informal decision making structure for the acquisition of new technologies. What may seem "interesting" or "useful" may be "too complex" or "useless" to the students themselves. It is important to take advantage of this most important resource - the students themselves - because in many instances students have prior experience using the equipment that others do not have. They may also be more aware of the latest trends, and what works best for them.

Value the opinions of students with disabilities in decision making. If equipment sits idle, there is obviously a reason. Rather than assume "lack of interest" or "lack of knowledge" on the part of students, proactive steps should be taken to evaluate the views and opinions of students on the state of equipment and support available to them on campus. Candid, non-defensive discussions can be beneficial. Anonymous yearly "formative" evaluations can also be useful in providing honest feedback. If students are dissatisfied with the equipment and support currently available to them, what better argument to take to senior administration to lobby them for better funding for specialized computer technology and related support?

Make acquisition decisions that reflect the needs of all students with disabilities. Computer and adaptive computer technologies at colleges and universities should meet the needs of all students, including students with disabilities. In this regard, it needs to be stressed that some adaptive technologies can be "cross-used" by students with different disabilities. Thus, "educated" acquisition decisions can, in the long run, prove to be most cost effective. For example, screen readers, as we found, can be beneficial not only to students who are blind or have low vision but also to students with specific learning disabilities. Similarly, scanners and voice recognition software can be useful to a host of students with disabilities.

Become informed and share information on government programs offering technology-based assistance for students with disabilities. It is evident from our findings that the vast majority of students with disabilities in Canada's colleges and universities are not aware of what programs exist to help them acquire computer technologies as assistive aids. Personnel responsible for providing services to postsecondary students with disabilities also were poorly informed. Many did not see this aspect of computer support for students with disabilities as part of their mandate. Some suggested that individuals in rehabilitation agencies should assist students with this concern.

Many students, however, are not in touch with a rehabilitation agency. This means that students are simply not informed about adaptive tools and technologies than could assist them in their studies. What is abundantly clear is that, at present, this aspect of computer support for students with disabilities is "nobody's mandate." As services for students with disabilities get increasingly centralised, decisions will need to be made about who, on campus, should be responsible.

Until such decisions are made, we recommend that individuals responsible for providing services to postsecondary students with disabilities seek out information about funding sources and make this available not only to the students they serve, but also to individuals who work in other sectors of the institution which come into contact with students with disabilities: for example, financial aid offices, learning centers, counselling, and health services. Additionally, personnel responsible for providing services to students with disabilities should offer assistance and guidance to students in navigating through the maze of application requirements that often accompany such programs. After all, the more equipment students have for personal use, the lower the demand on institutional resources! In this regard, service providers should also insist that any program-related literature be made available to students in alternative formats.

Make internet access for students with disabilities a priority. Our research indicates that many postsecondary institutions provide internet access to their students. However, only some institutions have adapted computers (e.g., computers with screen readers and alternative input devices) that are capable of going online. The wealth of information available to students, the fact that course material and other school related information are increasingly being put on the web, and the usefulness of e-mail are three strong reasons why providing adapted internet access is critical. We recommend that service providers advocate strongly to this effect to the computing professionals on campus.

Take advantage of the experience of others. Talking to your colleagues in the field, consulting other resources, and involving knowledgeable organizations as well as individuals with expertise on campus will make providing computer and adaptive computer resources in the future less daunting than expected. Lessons learned at postsecondary institutions that are of similar size to yours, knowledge about specific government programs to tap for funds, and strategies for dealing with administration doesn't have to be done in isolation.

In the future, with more computer mediated learning activities and a greater role for general use computer labs will necessitate the active involvement of other sectors in the institution (e.g., consultation with intersectorial committees including students, academic computer departments, computing support services, audio-visual, the library, learning center, physical plant representatives, faculty, student affairs, and adaptive technologists). This has been recommended by others as well (e.g., Burgstahler, 1992, 1993).

Get involved in planning bodies responsible for institution-wide information technology purchases and systems development. Two trends are evident in postsecondary institutions. Colleges and universities are adopting policies to ensure that their campuses are networked for the new millennium. They are also experimenting with new methods of delivering education (e.g., adding computer lab components to courses, placing course materials on the web, interactive tutorials, communities of learners, WebCT, distance education and online admissions and registration). These trends have consequences that affect the types of accommodations students with disabilities will require in the near future.

Involvement with other areas of the school can have benefits both for the present as well as the future. Personnel responsible for providing services to postsecondary students with disabilities must actively make themselves aware of the institutional priorities concerning campus-wide information technology purchases and systems development. They must lobby, strongly, on behalf of and in partnership with students with disabilities to ensure that accessibility of new computer and information technologies is made a priority. This is also true for distance education courses, which are increasingly using computer and information technologies. Indeed, it is expected that by 2002, 15% of US postsecondary students will be enrolled in online courses - a substantial increase over current levels (International Data Corp cited in Schofield, 1999). To ensure inclusion of all students in classroom activities, adaptive computer equipment will have to be available in general use computer labs and site licenses and server versions of adaptive software will need to be acquired in many instances.

Possible suggestions are: push strongly to ensure that all campus internet servers and web pages meet the minimum requirements for universal accessibility [cf. W3C (2001) site; Bobby Accessibility Checker (Cast, 2001; Cooper, 1999), newly developed A-Prompt Toolkit (2001)]; make sure that a text-based browser is available; ensure that knowledgeable students and representatives of the office for students with disabilities sit on committees that review and implement campus-wide computing decisions to ensure that accessibility is always on the agenda; work with professors and academic computing staff to educate them on access issues related to internet and computer components of their courses; influence decision makers to ensure that electronic versions of textbooks, "course-packs," and other instructional materials are made available in conjunction with print versions of the same information. These issues must be planned for and dealt with from the beginning, and not on an "ad hoc" basis, when it may be too late to do something for the student. The key point here is to work alongside, rather than separately from the campus community as a whole in addressing computer accessibility.

Individuals providing services to postsecondary students with disabilities in conjunction with their regional and national professional organizations as well as with interested student groups, must lobby the government, rehabilitation centres, technology loan banks, etc., to provide easier application processes, to relax strict rules barring students with certain disabilities, and any other "red-tape" that may stand in the way of students receiving technologies they require.

Recommendations For Other Postsecondary Education Stakeholders

Government organizations, ministries, rehabilitation agencies and others involved in providing technology for students with disabilities. There is an urgent need to review existing policies regarding and practice concerning training students who use adaptive computer technologies. According to our participants, in general, either training is not provided or training is of poor quality. If complex adaptive computer technologies are to be made available to students, then two things need to happen. First, someone has to be accountable for training students on the use of the equipment. The training needs to be delivered in a timely manner which respects academic calendars and timetables. Second, training and resource materials need to be provided to students for reference in a format they can use. There needs to be an understanding that campus based professionals who provide disability related services to students are not adaptive technology specialists, and that training students on technologies that were not purchased by the schools should not fall on their shoulders.

Administration College and university administrations need to make a priority of ensuring that accessible and inclusive design considerations are used when new learning and computer technologies are adopted and implemented on campus. Without buy-in from the top, it will be difficult, if not impossible to impress upon computer services staff, departments, and professors that use of inaccessible computer and learning technologies is unacceptable. This includes broad based review of current IT policies and purchasing procedures as well as review of professional development activities used to train faculty to incorporate technology in their teaching. The litmus test in all these cases is answering the question: "Are students with disabilities being considered?" Clear statements, policies, and increased investment in the form of funding accessible technologies for inclusion in general use computer labs and the purchase of accessible software and hardware are needed. Inviting professionals who provide services to students with disabilities to sit on IT committees and consulting with them on upcoming campus wide computer infrastructure improvements is also crucial. Students with disabilities, like other students, make an investment in their education. They have the right to demand equal access to all learning opportunities. Increasingly, this will mean access to distance and distributed learning, which, according to our participants, show poor accessibility. Failing to address these issues has damaging long term consequences.

Faculty. There is a need for professors to become better informed about how to make their teaching materials and the technology related components of their courses meet accessible and inclusive design principles. Faculty need to learn about the accessibly of various tools and formats to better assure that learning activities in their courses can be utilised by students with disabilities. When they receive training on how to incorporate computer and instructional technologies into their courses, faculty need to stress that the topic of accessibility must be addressed during training sessions

IT professionals. Those who work to provide information technology services and programs to their postsecondary institutions need to take advantage of the wealth of information currently available on campus and the internet to learn more about what is involved in providing technology that is accessible to the whole campus community. Taking concrete steps to ensure that all campus based web sites are accessible, adopting accessible courseware and web authoring tools, and providing, at a minimum, basic information to computer lab staff on adaptive technologies is vital. Informing and consulting with professionals who provide disability related services regarding upcoming changes, campus wide purchases, and policies is also essential.

Like other IT on campus, adaptive computer technologies also need installation, repair and maintenance. These technologies form part of the campus wide information network. Therefore, it makes sense that those who work in computer support services take the lead in servicing and supporting these technologies. Professionals who provide services to students with disabilities have expertise that lies outside the IT realm. Brining together both sets of expertise could only lead to a better, more accessible and technologically welcoming campus.

RESOURCES

Free and inexpensive computer technologies. It is noteworthy that only about half of the students in our studies who indicated needing adaptations used these. The overwhelming reason cited was that these cost too much. Other reasons are: it is unavailable to students; they are uncertain where to buy the technology; they don't know how to use the equipment; and equipment is too expensive to maintain.

It is advisable to try some adaptive computer technologies before buying. Many products have downloadable "demos" which are usually available at a company's web site. There are also a variety of readily available free or inexpensive products that do part or all of what the full-featured products do (Fichten, et al., 1999). These low cost products allow experimentation with technological solutions without having to make expensive purchases. These are not meant to replace the sophisticated, dedicated adaptive programs designed for individuals with specific disabilities or impairments. What makes these free or inexpensive technologies interesting is that they provide opportunities for students to test adaptations. These also provide "quick and dirty" solutions to frequent problems encountered by faculty such as having to make a last minute handout for a student who needs an audiotape. Similarly, when a professor wants a student who is blind to read material available on disk in his/her office, free or inexpensive document reading software can be accessed. Unless the material is scientific or highly technical, these free or inexpensive technologies can read the material to the student without the assistance of a reader. Similarly, free and inexpensive magnification software can allow students with low vision to see what is on the computer screen. For the web sites where these products are available as well as for new products, check the booklet prepared for students and services providers (Fossey et al, 2001a) or visit the "Download" section of the Adaptech Project (2001) web site.

Universal design on campus and resources. A barrier-free learning community involves universal access to information (cf. Ekberg, 1999). Guidelines for making programs and activities accessible have been proposed by several postsecondary educational institutions. Good examples are materials from Oregon State University (web accessibility guidelines, software access guidelines, hardware accessibility guidelines, 1999a, 1999b, 1999c, respectively) and Santa Monica College (1998, undated), and the distance education guidelines from Chancellor's Office of California Community Colleges (High Tech Center Training Unit, 1999). These resources, in addition to other well established North American organizations and web sites that are likely to have interesting, easily implementable solutions to common problems experienced in postsecondary education, are presented in the listing below. These resources provide information and tools to assist you in ensuring that computer, information and learning technologies on your campus are universally accessible.

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CONCLUSIONS

Computers are technologies that can be enabling - that allow students with disabilities to prepare for and to participate in the economy of tomorrow. To plan for the future rather than catch up with the past we recommend that the broadest based consultations take place at all postsecondary institutions and organizations and agencies which provide equipment and training for students with disabilities. Such consultations must involve students, who, of course, are ultimately the end-users. The complexity of the issues suggest that diverse sectors of the campus community need to collaborate to ensure that computer-based teaching materials and resources are accessible to students with different impairments. In this regard, we recommend that multidisciplinary computer accessibility advisory committees be constituted in postsecondary institutions with representation, at a minimum, by students with different disabilities who are knowledgeable about computer and adaptive computer technologies, those responsible for providing computer related services to students with disabilities, professors, and someone from computer support services as well as administration. Such committees could benefit from the expertise of academic computer staff, adaptive computer technology specialists, librarians, audio-visual specialists, and rehabilitation professionals, among others. Creative partnerships and alliances are urgently needed.

In addition, we suggest better coordination and collaboration between disability service providers and federal and provincial agencies, programs, and departments responsible for providing equipment subsidies and computer and adaptive computer technologies to students for off-campus use. This would allow for better coordination and better information dissemination about what is really required to meet the forthcoming computer related needs of students with disabilities.

Planning for campus-wide information technology purchases and computer infrastructure improvements in community/junior colleges and universities are actively proceeding. The needs of students with disabilities are simply overlooked in much of the planning until it is discovered, often much too late, that the expensive new technology is inaccessible. This is not done through malice but through lack of forethought. Designing for accessibility always results in better, less expensive, and more timely solutions than retrofits. Implementing accessibility features in the initial design of information and instructional technology results in fewer design, construction and legal expenses. It is important to ensure that the needs and concerns of students with all types of disabilities are represented in planning decisions from their inception. Individuals responsible for providing services to students with disabilities can do much to ensure that the potential of computer, information and adaptive technologies to empower students with disabilities is realized.

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APPENDIX A - TABLES

Table 1

Table 1

Participation Rate of Institutions

Province	Institution Type	Number Of ACCC / AUCC Institutions On Lists[2]	Ineligible			Eligible				Institutional Return Rate	Rate Of "No Students With Disabilities"
			No Students Enrolled	Not Applicable[1]	No Students With Disabilities	Unreachable	Refused	Participated	Total		
British Columbia	College	21		4	2		3	12	15	80%	12%
British Columbia	University	10		4				6	6	100%	0%
Alberta	College	15		1		2	2	10	14	71%	0%
Alberta	University	7		3			1	3	4	75%	0%
Saskatchewan	College	13		8	2		1	2	3	67%	40%
Saskatchewan	University	2						2	2	100%	0%
Manitoba	College	6			1		1	4	5	80%	17%
Manitoba	University	4		1			1	2	3	67%	0%
Ontario	College	30		2	2	1	1	24	26	92%	7%
Ontario	University	29		8	1	1	2	17	20	85%	5%
Québec	College	39	2	1	5	3	5	23	31	74%	14%
Québec	University	19	1		1	2	3	12	17	71%	6%
New Brunswick	College	13		8		1	1	3	5	60%	0%
New Brunswick	University	4						4	4	100%	0%
Nova Scotia	College	4			1		1	2	3	67%	25%
Nova Scotia	University	10		2			2	6	8	75%	0%
Prince Edward Island	College	2						2	2	100%	0%
Prince Edward Island	University	1						1	1	100%	0%
Newfoundland	College	11		4		1	1	5	7	71%	0%
Newfoundland	University	1						1	1	100%	0%
Territories (All)	College	3						3	3	100%	0%
Territories (All)	University	0									
Distance Ed.	College	1						1	1	100%	0%
Distance Ed.	University	2					1	1	2	50%	0%
Total		**247**	**3**	**46**	**15**	**11**	**26**	**146**	**183**	**80%**	**8%**

[1] Not Applicable: institution/campus is looked after by another listed institution, is a distance education institution, is listed both as a college and as university (considered as a college).

[2] Number of institutions listed on April 22, 2000.

Table 2

Table 2

Demographics: Participation Of Individuals Responsible For Providing Services To Students With Disabilities

Province	Participants		Participant's Institution Is			Participant's Institution Is		Participants Are From	
	Number	Percent	Anglophone	Francophone	Bilingual	College	University	Colleges	Universities
Alberta	17	11%	17			14	3	10	3
British Columbia	19	12%	19			13	6	12	6
Manitoba	6	4%	5	1		4	2	4	2
New Brunswick	8	5%	5	3		3	5	3	4
Newfoundland	7	4%	7	0		5	2	5	1
Nova Scotia	9	6%	8	1		3	6	2	6
Ontario	43	28%	40	2	1	24	19	24	17
Prince Edward Island	3	2%	2	1		2	1	2	1
Québec	35	22%	4	31		23	12	23	12
Saskatchewan	4	3%	4			2	2	2	2
Territories (All)	3	2%	3			3	0	3	0
Distance Ed	2	1%	2			1	1	1	1
Total	156	100%	116	39	1	97	59	91	55

Province	Participant's Institution Is						Sex	
	Anglophone		Francophone		Bilingual			
	College	University	College	University	College	University	Female	Male
Alberta	14	3					12	5
British Columbia	13	6					17	2
Manitoba	3	2	1				6	0
New Brunswick	1	4	2	1			5	3
Newfoundland	5	2	0	0	0		5	2
Nova Scotia	3	5	0	1	0		6	3
Ontario	22	18	2	0	0	1	31	12
Prince Edward Island	1	1	1	0	0		2	1
Québec	2	2	21	10			18	17
Saskatchewan	2	2					4	0
Territories (All)	3	0					2	1
Distance Ed	1	1					2	0
Total	70	46	27	12	0	1	110	46

[1] There were 2 participants per institution in 10 institutions (i.e., multiple campuses or sectors not listed in the AUCC or ACCC directories): 4 Alberta colleges, 1 British Columbia college, 2 Ontario universities, 1 Nova Scotia college, 1 New Brunswick university, 1 Newfoundland university. Thus the 156 participants represent 146 independent members of AUCC or ACCC. Whenever an institution was a member of both ACCC and AUCC, the institution was counted as a college rather than a university.

Table 3

Table 3

Characteristics of Service Providers: Years of Experience and Knowledge About Computer, Information And Adaptive Computer Technologies

Language	Institution	Sex	Mean	Std. Deviation	N	ANOVA	df	F	p
Years Of Experience Working With Students With Disabilities [1]									
Anglophone	College	Female	9.72	5.79	49				
		Male	11.88	7.78	19	Language	1	4.93	0.028
		Total	10.33	6.42	68	Institution	1	0.82	0.367
	University	Female	8.62	5.15	33	Sex	1	4.28	0.040
		Male	10.67	5.47	12	Language * Institution	1	0.00	0.966
		Total	9.17	5.25	45	Language * Sex	1	0.12	0.726
	Total	Female	9.28	5.54	82	Institution * Sex	1	0.04	0.845
		Male	11.41	6.90	31	Language * Institution * Sex	1	0.02	0.880
		Total	9.86	5.99	113	Error	143		
Francophone	College	Female	6.34	3.42	16				
		Male	9.73	7.24	11				
		Total	7.72	5.46	27				
	University	Female	5.71	3.50	7				
		Male	8.25	2.50	4				
		Total	6.64	3.29	11				
	Total	Female	6.15	3.38	23				
		Male	9.33	6.26	15				
		Total	7.41	4.91	38				
Total	College	Female	8.89	5.48	65				
		Male	11.09	7.54	30				
		Total	9.59	6.25	95				
	University	Female	8.11	4.99	40				
		Male	10.06	4.93	16				
		Total	8.67	5.01	56				
	Total	Female	8.60	5.29	105				
		Male	10.73	6.70	46				
		Total	9.25	5.82	151				
How Knowledgeable Are Service Providers About Computer And Adaptive Computer Technologies [1]									
Anglophone	College	Female	4.13	1.41	50				
		Male	3.53	1.50	19	Language	1	5.83	0.017
		Total	3.96	1.45	69	Institution	1	0.03	0.868
	University	Female	4.08	1.41	33	Sex	1	0.78	0.380
		Male	3.33	1.72	12	Language * Institution	1	0.05	0.827
		Total	3.88	1.52	45	Language * Sex	1	1.48	0.226
	Total	Female	4.11	1.40	83	Institution * Sex	1	0.08	0.783
		Male	3.45	1.57	31	Language * Institution * Sex	1	0.00	0.952
		Total	3.93	1.47	114	Error	143		
Francophone	College	Female	2.88	1.31	16				
		Male	3.09	1.92	11				
		Total	2.96	1.56	27				
	University	Female	3.00	1.55	6				
		Male	3.00	0.82	4				
		Total	3.00	1.25	10				
	Total	Female	2.91	1.34	22				
		Male	3.07	1.67	15				
		Total	2.97	1.46	37				
Total	College	Female	3.83	1.48	66				
		Male	3.37	1.65	30				
		Total	3.68	1.54	96				
	University	Female	3.91	1.47	39				
		Male	3.25	1.53	16				
		Total	3.72	1.50	55				
	Total	Female	3.86	1.47	105				
		Male	3.33	1.59	46				
		Total	3.70	1.52	151				

Note. Boxed items are significant or approach significance.

[1] Excluding distance education and bilingual institutions.

Table 4

Table 4

Students With Disabilities Registered To Receive Services From Their Educational Institution In Canadian Provinces And Territories

Province	Institution	N	Number Of Students With Disabilities		Total Enrollment		Percentage Of Students With Disabilities[1]	
			Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Alberta	College	14	172.71	229.46	6910.79	8297.40	5.13%	9.10%
	University	3	280.00	207.85	19666.67	12342.34	1.25%	0.54%
	Total	17	191.65	223.51	9161.82	10005.22	4.44%	8.35%
British Columbia	College	13	301.33	179.07	8361.46	7002.66	4.53%	2.74%
	University	6	178.60	140.20	16980.83	12554.80	2.14%	2.64%
	Total	19	265.24	174.02	11083.37	9665.39	3.83%	2.86%
Manitoba	College	4	144.50	207.72	8911.00	15789.21	3.62%	4.62%
	University	2	375.00	176.78	13900.00	11172.29	4.74%	5.08%
	Total	6	221.33	215.19	10574.00	13460.35	3.99%	4.28%
New Brunswick	College	3	13.00	14.73	716.67	678.85	1.60%	0.43%
	University	5	58.00	62.51	3774.00	3016.85	2.11%	1.58%
	Total	8	41.13	53.27	2627.50	2799.32	1.92%	1.24%
Newfoundland	College	5	76.00	69.14	1756.00	2103.49	6.05%	5.59%
	University	2	65.00	49.50	8600.00	10465.18	1.56%	1.33%
	Total	7	72.86	60.20	3711.43	5688.20	4.76%	5.09%
Nova Scotia	College	3	183.33	123.32	4733.33	2309.40	3.67%	0.73%
	University	6	83.67	53.39	5267.67	4214.59	1.63%	0.83%
	Total	9	116.89	89.82	5089.56	3536.44	2.31%	1.27%
Ontario	College	24	479.54	383.41	7121.21	5575.57	7.64%	2.73%
	University	19	373.74	254.93	15325.47	12490.48	3.18%	2.11%
	Total	43	432.79	333.44	10746.35	10043.97	5.67%	3.32%
Prince Edward Island	College	2	51.00	69.30	1120.00	1527.35	4.77%	0.32%
	University	1	100.00		2500.00		4.00%	
	Total	3	67.33	56.58	1580.00	1342.09	4.52%	0.50%
Quebec	College	23	19.39	41.69	3289.57	1845.98	0.62%	1.18%
	University	12	101.50	157.89	16696.25	13932.91	0.41%	0.58%
	Total	35	47.54	103.70	7886.14	10329.46	0.55%	1.01%
Saskatchewan	College	2	170.00	197.99	12650.00	17465.54	5.62%	6.19%
	University	2	282.50	166.17	15000.00	4242.64	1.80%	0.60%
	Total	4	226.25	162.76	13825.00	10465.30	3.71%	4.22%
Territories (All)	College	3	35.33	39.31	616.67	678.85	5.57%	2.50%
	Total	3	35.33	39.31	616.67	678.85	5.57%	2.50%
Distance Ed	Distance Ed	2	299.00	210.72	10000.00	7071.07	4.98%	5.63%
	Total	2	299.00	210.72	10000.00	7071.07	4.98%	5.63%
Total	College	96	211.41	287.18	5647.74	6541.98	4.44%	4.88%
	University	58	217.35	219.49	13455.17	11727.88	2.11%	2.03%
	Distance Ed	2	299.00	210.72	10000.00	7071.07	4.98%	5.63%
	Total	156	214.75	262.10	8606.30	9559.18	3.58%	4.20%

[1] Percentages are not identical to values obtained by dividing due to rounding errors.

Table 5

Table 5

Students With Disabilities Registered To Receive Services From Their Educational Institution: Comparison of Colleges versus Universities

Variable	Institution	N	Mean	Std. Deviation	t	df	p
Number Of Students With Disabilities	College	95	211.42	287.18	-0.13	150	0.893
	University	57	217.37	219.47			
Total Enrollment	College	96	5647.74	6541.98	-4.65	152	0.000
	University	58	13455.17	11727.88			
Percentage Of Students With Disabilities[1]	College	95	4.44%	4.88%	4.10	150	0.001
	University	57	2.11%	2.03%			

Note. Boxed items are significant or approach significance.

[1] Percentages are not identical to values obtained by dividing due to rounding errors.

Table 6

Table 6

Similarities And Differences Between Institutions: Student Enrollments

Variable	Institution	Region	Mean	Std. Deviation	N	ANOVA	df	F	p
Regional Differences: Institutions In Québec And The Rest Of Canada									
Number Of Students With Disabilities									
	College	Québec	19.39	41.69	23	Institution	1	0.33	0.566
		Rest Of Canada	272.75	304.78	72	Region	1	15.93	0.000
		Total	211.41	287.18	95	Institution * Region	1	1.13	0.289
	University	Québec	101.50	157.89	12	Error	148		
		Rest Of Canada	248.24	224.60	45				
		Total	217.35	219.49	57				
	Total	Québec	47.54	103.70	35				
		Rest Of Canada	263.32	275.93	117				
		Total	213.64	263.09	152				
Total Enrollment									
	College	Québec	3289.57	1845.98	23	Institution	1	30.75	0.000
		Rest Of Canada	6390.73	7286.40	73	Region	1	0.08	0.781
		Total	5647.74	6541.98	96	Institution * Region	1	4.13	0.044
	University	Québec	16696.25	13932.91	12	Error	150		
		Rest Of Canada	12609.67	11101.18	46				
		Total	13455.17	11727.88	58				
	Total	Québec	7886.14	10329.46	35				
		Rest Of Canada	8794.69	9414.91	119				
		Total	8588.20	9603.12	154				
Percentage Of Students With Disabilities									
	College	Québec	0.62%	1.18%	23	Institution	1	5.03	0.026
		Rest Of Canada	5.66%	4.99%	72	Region	1	23.66	0.000
		Total	4.44%	4.88%	95	Institution * Region	1	3.80	0.053
	University	Québec	0.41%	0.58%	12	Error	148		
		Rest Of Canada	2.56%	2.04%	45				
		Total	2.11%	2.03%	57				
	Total	Québec	0.55%	1.01%	35				
		Rest Of Canada	4.47%	4.37%	117				
		Total	3.57%	4.20%	152				
Linguistic Differences: Similarities And Differences Between Anglophone and Francophone Institutions									
Number Of Students With Disabilities									
	College	Anglophone	288.07	306.71	68	Language	1	27.36	0.000
		Francophone	18.37	41.04	27	Institution	1	0.00	0.945
		Total	211.42	287.18	95	Language * Institution	1	0.16	0.686
	University	Anglophone	265.36	224.29	44	Error	147		
		Francophone	34.50	47.47	12				
		Total	215.89	221.17	56				
	Total	Anglophone	279.15	276.39	112				
		Francophone	23.33	43.14	39				
		Total	213.08	263.86	151				
Total Enrollment									
	College	Anglophone	6871.49	7276.88	69	Language	1	2.19	0.141
		Francophone	2520.37	1937.13	27	Institution	1	23.23	0.000
		Total	5647.74	6541.98	96	Language * Institution	1	1.05	0.307
	University	Anglophone	13462.09	11318.89	45	Error	149		
		Francophone	12675.50	13861.96	12				
		Total	13296.49	11769.14	57				
	Total	Anglophone	9473.04	9603.19	114				
		Francophone	5645.03	8985.37	39				
		Total	8497.27	9567.91	153				
Percentage Of Students With Disabilities									
	College	Anglophone	5.59%	5.02%	68	Language	1	18.36	0.000
		Francophone	1.55%	3.01%	27	Institution	1	8.03	0.005
		Total	4.44%	4.88%	95	Language * Institution	1	1.22	0.272
	University	Anglophone	2.63%	2.03%	44	Error	147		
		Francophone	0.26%	0.19%	12				
		Total	2.13%	2.05%	56				
	Total	Anglophone	4.43%	4.35%	112				
		Francophone	1.15%	2.56%	39				
		Total	3.58%	4.21%	151				

Note. Boxed items are significant or approach significance.
Percentages are not identical to values obtained by dividing due to rounding errors.

Table 7

Table 7

Similarities And Differences Between Same Language and Same Institution Types In Québec And The Rest Of Canada

Variable	Region	N	Mean	Std. Deviation	t	df	p
Francophone Colleges							
Number Of Students With Disabilities	Québec	21	17.00	42.62	-0.319	25	0.752
	Rest Of Canada	6	23.17	38.18			
Total Enrollment	Québec	21	3093.33	1806.43	3.414	25	0.002
	Rest Of Canada	6	515.00	505.52			
Percentage Of Students With Disabilities[1]	Québec	21	0.59%	1.23%	-2.158	25	0.081
	Rest Of Canada	6	4.91%	4.86%			
Francophone Universities							
Number Of Students With Disabilities	Québec	10	38.20	51.18			
	Rest Of Canada	2	16.00	19.80			
Total Enrollment	Québec	10	14630.00	14418.36			
	Rest Of Canada	2	2903.00	3672.71			
Percentage Of Students With Disabilities[1]	Québec	10	0.18%	0.12%			
	Rest Of Canada	2	0.60%	0.08%			
Anglophone Colleges							
Number Of Students With Disabilities	Québec	2	45.00	21.21			
	Rest Of Canada	66	295.44	308.35			
Total Enrollment	Québec	2	5350.00	636.40			
	Rest Of Canada	67	6916.91	7381.00			
Percentage Of Students With Disabilities[1]	Québec	2	1.03%	0.01%			
	Rest Of Canada	66	5.73%	5.03%			
Anglophone Universities							
Number Of Students With Disabilities	Québec	2	418.50	96.87			
	Rest Of Canada	42	258.07	226.57			
Total Enrollment	Québec	2	27027.50	2867.32			
	Rest Of Canada	43	12831.14	11173.71			
Percentage Of Students With Disabilities[1]	Québec	2	1.58%	0.53%			
	Rest Of Canada	42	2.68%	2.06%			

Note. Boxed items are significant or approach significance. Where no values are provided it was inappropriate to carry out inferential statistics due to sample sizes.

[1] Percentages are not identical to values obtained by dividing due to rounding errors.

Table 8

Table 8

Francophone And Anglophone Universities And Colleges Inside And Outside Québec

Variable	Institution	Region	Language	N	Mean	Std. Deviation	Minimum	Maximum
Number Of Students With Disabilities								
	College	Quebec	Anglophone	2	45.00	21.21	30	60
			Francophone	21	16.95	42.64	0	200
		Other Provinces	Anglophone	66	295.44	308.35	6	1800
			Francophone	6	23.17	38.18	2	100
	University	Quebec	Anglophone	2	418.50	96.87	350	487
			Francophone	10	38.10	51.26	0	130
		Other Provinces	Anglophone	42	258.07	226.57	10	1000
			Francophone	2	16.00	19.80	2	30
			Bilingual	1	300.00	.	300	300
	Distance Ed.	Other Provinces	Anglophone	2	299.00	210.72	150	448
			Total	154	214.75	262.10	0	1800
Total Enrollment								
	College	Quebec	Anglophone	2	5350.00	636.40	4900	5800
			Francophone	21	3093.33	1806.43	120	6800
		Other Provinces	Anglophone	67	6916.91	7381.00	200	32594
			Francophone	6	515.00	505.52	40	1350
	University	Quebec	Anglophone	2	27027.50	2867.32	25000	29055
			Francophone	10	14630.00	14418.36	700	37000
		Other Provinces	Anglophone	43	12831.14	11173.71	220	45000
			Francophone	2	2903.00	3672.71	306	5500
			Bilingual	1	22500.00	.	22500	22500
	Distance Ed.	Other Provinces	Anglophone	2	10000.00	7071.07	5000	15000
			Total	156	8606.30	9559.18	40	45000
Percentage Of Students With Disabilities[1]								
	College	Quebec	Anglophone	2	1.03%	0.01%	1.02%	1.03%
			Francophone	21	0.59%	1.23%	0.00%	5.71%
		Other Provinces	Anglophone	66	5.73%	5.03%	0.77%	35.64%
			Francophone	6	4.91%	4.86%	0.89%	13.33%
	University	Quebec	Anglophone	2	1.58%	0.53%	1.20%	1.95%
			Francophone	10	0.18%	0.12%	0.00%	0.35%
		Other Provinces	Anglophone	42	2.68%	2.06%	0.30%	10.23%
			Francophone	2	0.60%	0.08%	0.55%	0.65%
			Bilingual	1	1.33%	.	1.33%	1.33%
	Distance Ed.	Other Provinces	Anglophone	2	4.98%	5.63%	1.00%	8.96%
			Total	154	3.58%	4.20%	0.00%	35.64%

Table 9

Table 9

Correlation Between The Percentage Of Students With Disabilities And Total Enrollment

	Whole Sample	Colleges			Universities		
		All	Anglophone	Francophone	All	Anglophone	Francophone
Correlation	-0.229	-0.121	-0.263	-0.368	-0.274	-0.382	0.126
Significance	0.004	0.244	0.030	0.059	0.039	0.010	0.695
N	154	95	68	27	57	44	12

Note. Pearson product-moment correlations. Boxed items are significant or approach significance.

Table 10

Table 10

Availability of Computers on Campus: Institution Type and Language

Computers for Students with Disabilities on Campus	Colleges			Universities			Total
	All	Anglophone	Francophone	All	Anglophone	Francophone	
Yes	78	55	23	53	41	12	131
No	18	14	4	4	4	0	22
Total	96	69	27	57	45	12	153

Table 11

Table 11

Enrollment In Colleges With And Without Computers For Their Students With Disabilities

Variable	Computers for Students with Disabilities on Campus	N	Mean	Std. Deviation	t	df	p
Number Of Students With Disabilities	Yes	78	234.17	299.42	1.669	93	0.098
	No	17	107.06	197.41			
Total Enrollment	Yes	78	5898.21	6560.76	0.779	94	0.438
	No	18	4562.39	6531.90			
Percentage Of Students With Disabilities[1]	Yes	78	4.78%	5.15%	1.473	93	0.144
	No	17	2.87%	3.01%			

Note. Boxed items are significant or approach significance.

[1] Percentages are not identical to values obtained by dividing due to rounding errors.

Table 12

Table 12

Importance Of Computers And Related Services And Campus Advisory/Steering Committees

	Colleges			Universities			All[3]
	All[3]	Anglophone	Francophone	All[3]	Anglophone	Francophone	
Have An Advisory/Steering Committee[2]							
Yes							
Frequency	16	13	3	18	15	3	34
Percent	17%	19%	12%	35%	36%	30%	23%
No							
Frequency	76	54	22	35	27	7	111
Percent	83%	81%	88%	66%	64%	70%	77%
Priority Of Computer Related Services[2]							
Very High Priority	18%	16%	22%	26%	31%	8%	21%
High Priority	43%	45%	37%	46%	40%	67%	44%
Low Priority	30%	30%	30%	18%	18%	17%	26%
Very Low Priority	9%	9%	11%	11%	11%	8%	10%
Membership Of Advisory/Steering Committee[1]							
Someone from the office for students with disabilities							100%
Administrators							88%
Students with disabilities							81%
Faculty							78%
Students without disabilities							31%
Computer services staff							25%

[1]Based on the 34 non distance education institutions that have a committee. Neither distance education institution had a committee.
[2] Excluding distance education institutions.
[3] Includes bilingual institutions.

Table 13

Adequacy In Meeting the Computer Related Needs Of Students with Disabilities: Mean Scores for Actual Conditions Inside the Institution

Actual Situation: Adequacy In Meeting The Needs Of Students With Disabilities	Whole Sample			College				University				ANOVA[1]			
				Anglophone		Francophone		Anglophone		Francophone		df	Main Effect F		Interaction
	N	Mean	SD	N	Mean SD	N	Mean SD	N	Mean SD	N	Mean SD		Language	Institution	
Overall rating about how well students' computer related needs are met	136	4.20	1.44	92	4.16 1.34	40	4.36 1.73	25	4.04 1.59	11	4.55 1.75	(1,134)	0.04	1.70	0.19
Average		**4.20**			**4.16**		**4.36**		**4.04**		**4.55**				
Inside & Outside The Institution Factors															
Funding															
Funding For Institution's Adaptive Computer Technologies	147	3.50	1.70	97	3.19 1.72	28	4.04 1.54	44	3.31 1.65	14	5.00 1.10	(1,141)	14.61***	2.27	1.42
Average		**3.50**			**3.19**		**4.04**		**3.31**		**5.00**				
Inside The Institution Factors															
Access To Adaptive Computer Technologies															
Hours Of Access To Computers	123	4.28	1.43	92	4.15 1.42	21	4.05 1.72	41	4.34 1.50	9	5.33 1.00	(1,119)	1.66	5.19*	2.99+
Computer Technologies Up-To-Date	129	4.26	1.44	55	3.98 1.41	23	4.13 1.58	41	4.56 1.42	10	4.90 1.20	(1,125)	0.83	4.89*	0.10
Off Campus Loan Program	76	3.75	1.62	32	3.66 1.58	17	3.41 1.91	21	3.81 1.54	6	5.00 0.63	(1,72)	1.15	3.89+	2.64
Availability In Specialized Labs/Centres	115	3.74	1.63	49	3.63 1.67	18	3.78 1.77	40	3.63 1.58	8	4.75 1.03	(1,143)	3.05+	1.79	1.73
Physical Space Available for Computer Technologies	123	3.58	1.72	52	3.33 1.76	21	3.81 1.64	41	3.57 1.69	9	4.56 1.33	(1,119)	3.63+	1.67	0.42
Training For Students On Adaptive Computer Technologies	118	3.17	1.68	52	3.10 1.67	19	3.21 1.75	39	3.05 1.70	8	4.13 1.46	(1,114)	2.26	1.71	1.47
Availability In Mainstream Computer Labs	140	2.81	1.72	97	2.72 1.58	22	4.09 1.72	40	2.18 1.50	9	3.33 2.06	(1,136)	1.49	5.33	0.77
Average		**3.66**			**3.51**		**3.78**		**3.59**		**4.58**	MANOVA (7,61)	1.61	1.83+	1.19
Internet/Library & Adaptive Computer Technologies															
Enough Adapted Computers With Internet Access	123	3.70	1.81	51	3.37 1.84	23	4.30 1.64	40	3.55 1.64	9	4.67 1.41	(1,119)	6.65*	0.46	0.05
Library's Computers Accessible	144	3.43	1.73	62	3.05 1.49	26	3.92 1.71	45	3.42 1.75	11	4.45 1.57	(1,140)	8.28**	1.87	0.86
Internet-Based Distance Education Accessible	89	2.54	1.51	44	2.48 1.35	14	2.43 1.71	24	2.54 1.56	7	3.71 1.60	(1,85)	2.40	3.17+	2.36
Average		**3.22**			**2.94**		**3.55**		**3.16**		**4.28**	MANOVA (3,59)	1.79	4.32*	0.77
Support For Adaptive Computer Technologies															
Administration Reacts Positively Concerning Computer Accessibility	140	4.25	1.42	95	4.09 1.40	23	4.91 1.68	40	4.03 1.25	9	4.78 1.20	(1,136)	6.54*	0.10	0.01
Technical Support	125	3.48	1.65	54	3.44 1.61	21	3.57 1.83	41	3.35 1.78	9	4.11 1.45	(1,121)	1.49	0.33	0.77
Opportunities For Employees To Learn About Adaptive Technologies	149	3.24	1.73	69	3.39 1.63	24	2.67 1.81	45	3.40 1.78	11	2.91 1.37	(1,145)	2.92+	0.12	0.11
Specialist In Adaptive Computer Technologies On Campus	143	3.06	1.91	68	3.41 1.92	26	2.12 1.40	43	3.37 2.06	10	2.80 0.94	(1,138)	11.77***	0.04	0.01
Computer Support People Can Service Adaptive Technologies	135	3.80	1.73	60	3.95 1.55	24	3.21 1.93	41	3.85 1.66	10	3.30 1.95	(1,131)	0.87	0.00	0.07
Consulted When Computer Infrastructure Decisions Made	145	2.26	1.71	66	2.08 1.62	24	2.29 1.81	44	2.18 1.62	11	3.64 1.96	(1,141)	5.94*	4.49*	3.13+
Advisory/Steering Committee Deals with Computer Accessibility	144	2.70	1.82	67	2.66 1.62	25	1.76 1.42	42	2.64 2.16	10	2.40 2.27	(1,140)	0.50	2.55	0.01
Average		**3.87**			**3.66**		**2.93**		**3.11**		**3.30**	MANOVA (7,55)	4.73***	1.09	0.85
Faculty And Computer Accessibility															
Computer-Based Teaching Materials Used By Professors Accessible	121	3.14	1.56	51	2.84 1.36	24	4.00 1.67	26	2.85 1.50	10	3.60 1.71	(1,117)	8.56**	0.37	0.38
Faculty Trained In Adaptive Computer Technologies	135	1.96	1.38	61	2.03 1.40	25	2.58 1.53	38	1.51 1.08	11	1.73 1.49	(1,131)	1.73	5.76*	0.31
Average		**2.52**			**2.41**		**2.71**		**2.48**		**2.83**	MANOVA (3,59)	4.98**	1.61	0.32
Outside The Institution Factors															
Agencies Provide Students With Appropriate Equipment	141	4.27	1.34	87	4.19 1.34	27	4.41 1.29	39	4.13 1.36	8	5.13 0.83	(1,137)	4.05*	1.18	1.70
Agencies Provide Students With Adequate Training	141	3.30	1.61	84	3.09 1.52	26	3.54 1.53	42	3.29 1.81	9	4.22 1.30	(1,137)	3.97*	1.61	0.44
Average		**3.79**			**3.64**		**3.97**		**3.71**		**4.67**	MANOVA (3,59)	3.53*	1.13	0.87

Note: Bolded values refer to MANOVA scores. Otherwise, F scores are for univariate ANOVAs.
Based on a 6 point scale, with higher scores indicating stronger agreement with the statement.
*** p< .001 ** p< .01 * p< .05 + p< .10

Table 14

Table 14

Adequacy In Meeting The Computer Related Needs Of Students With Disabilities: Correlations With Enrollment Statistics

Variable		Whole Sample[1]	College		University	
			Anglophone[2]	Francophone[3]	Anglophone[4]	Francophone[5]
Total Enrollment	Correlation	0.149	0.072	0.227	0.226	0.100
	Significance	0.078	0.577	0.274	0.161	0.769
	N	141	62	25	40	11
Number Of Students With Disabilities	Correlation	0.135	0.222	0.075	0.161	-0.048
	Significance	0.112	0.083	0.720	0.326	0.889
	N	140	62	25	39	11
Percentage Of Students With Disabilities	Correlation	0.114	0.257	0.122	-0.001	0.004
	Significance	0.178	0.043	0.56	0.996	0.991
	N	140	62	25	39	11

Note. Pearson product-moment correlation coefficients (r). Boxed values denote items that are significant or approach significance.

Table 15

Table 15

Comparison of Institutions With and Without Computer Technologies on Campus for Students with Disabilities: Actual Conditions

Variable	Computer on Campus	N	Mean[1]	SD	t	df	Sig.
Overall rating about how well students' computer related needs are met	Yes	127	4.26	1.36	1.63	136	0.106
	No	11	3.55	1.81			
Inside and outside the institution factors							
Funding							
Funding for institution's adaptive computer technologies	Yes	127	3.47	1.74	-0.55	145	0.586
	No	20	3.70	1.87			
Inside the institution factors							
Access to adaptive computer technologies							
Availability in mainstream computer labs	Yes	122	2.81	1.68	-0.05	138	0.960
	No	18	2.83	2.01			
Internet/library and adaptive computer technologies							
Internet-based distance education accessible	Yes	78	2.60	1.55	1.05	87	0.297
	No	11	2.09	1.22			
Library's computers accessible	Yes	124	3.54	1.63	2.00	142	0.048
	No	20	2.75	1.71			
Support for adaptive computer technologies							
Computer support people can service adaptive technologies	Yes	118	2.95	1.72	-0.76	133	0.451
	No	17	3.29	1.86			
Advisory/steering committee deals with computer accessibility	Yes	122	2.28	1.86	1.20	142	0.232
	No	22	1.77	1.54			
Specialist in adaptive computer technologies on campus	Yes	123	3.18	1.92	1.81	141	0.072
	No	20	2.35	1.73			
Consulted when computer infrastructure decisions made	Yes	124	2.34	1.74	1.44	143	0.153
	No	21	1.76	1.41			
Administration reacts positively concerning computer accessibility	Yes	118	4.25	1.44	0.08	138	0.935
	No	22	4.23	1.38			
Opportunities for employees to learn about adaptive technologies	Yes	127	3.35	1.72	1.79	147	0.076
	No	22	2.64	1.71			
Faculty and computer accessibility							
Computer-based teaching materials used by professors accessible	Yes	105	3.12	1.53	-0.31	119	0.755
	No	16	3.25	1.77			
Faculty trained in adaptive computer technologies	Yes	118	1.96	1.39	0.06	133	0.954
	No	17	1.94	1.39			
Personal factors							
Knowledgeable about adaptive computer technologies	Yes	129	3.78	1.51	1.57	149	0.119
	No	22	3.23	1.57			

Note. Boxed items denote items that are significant or approach significance

[1] Based on a 6-point scale, with higher scores indicating stronger agreement with the statement

Table 16

Table 16

Adequacy In Meeting The Needs Of Students With Disabilities: Correlations With Actual Conditions Inside The Institution In Rank Order

Actual Situation: Adequacy In Meeting The Needs Of Students With Disabilities (in rank order)	Whole Sample[1]	College		University	
		Anglophone[2]	Francophone[3]	Anglophone[4]	Francophone[5]
Inside & Outside The Institution Factors					
Funding	0.536	0.512	0.532	0.484	0.772
Funding For Institution's Adaptive Computer Technologies					
Average					
Inside The Institution Factors					
Access To Adaptive Computer Technologies					
Computer Technologies Up-To-Date	0.603	0.571	0.583	0.625	0.603
Off-Campus Loan Program	0.592	0.498	0.719	0.471	0.643
Availability In Specialized Labs/Centres	0.534	0.539	0.579	0.430	0.784
Training For Students On Adaptive Computer Technologies	0.459	0.356	0.535	0.576	-0.080
Physical Space Available for Computer Technologies	0.308	0.280	0.299	0.424	0.142
Hours Of Access To Computers	0.298	0.117	0.217	0.588	0.687
Availability In Mainstream Computer Labs	0.287	0.312	0.668	0.170	0.029
Average					
Internet/Library & Adaptive Computer Technologies					
Enough Adapted Computers With Internet Access	0.460	0.479	0.482	0.367	0.909
Library's Computers Accessible	0.180	0.319	0.000	0.163	-0.026
Internet-Based Distance Education Accessible	0.177	0.068	0.349	0.395	0.358
Average					
Support For Adaptive Computer Technologies					
Technical Support	0.396	0.249	0.413	0.459	0.692
Specialist In Adaptive Computer Technologies On Campus	0.211	0.185	0.362	0.331	-0.663
Opportunities For Employees To Learn About Adaptive Technologies	0.209	0.306	0.058	0.221	0.045
Administration Reacts Positively Concerning Computer Accessibility	0.203	0.143	-0.004	0.470	0.317
Consulted When Computer Infrastructure Decisions Made	0.096	0.110	-0.220	0.388	-0.053
Advisory/Steering Committee Deals with Computer Accessibility	0.056	0.045	0.302	0.005	-0.375
Computer Support People Can Service Adaptive Technologies	-0.018	-0.135	0.520	-0.173	-0.508
Average					
Faculty And Computer Accessibility					
Computer-Based Teaching Materials Used By Professors Accessible	0.348	0.262	0.432	0.276	0.789
Faculty Trained In Adaptive Computer Technologies	0.050	-0.041	0.338	0.075	0.063
Average					
Outside The Institution Factors					
Agencies Provide Students With Adequate Training	0.162	0.079	0.246	0.101	0.736
Agencies Provide Students With Appropriate Equipment	-0.050	-0.236	0.029	0.144	0.230
Average					
Personal Factors					
Knowledgeable About Adaptive Computer Technologies	0.291	0.449	0.277	0.275	-0.201
Average					

Note. Pearson product-moment correlation coefficients (r). Boxed values denote items that are significant or approach significance.

[1] Values based on Ns ranging from 130 to 140.

[2] Values based on Ns ranging from 47 to 62.

[3] Values based on Ns ranging from 21 to 25.

[4] Values based on Ns ranging from 32 to 40.

[5] Values based on Ns ranging from 9 to 10.

Table 17

Table 17

Meeting The Computer Related Needs Of Students: Similarities and Differences Between Actual And Desired Situations

Actual Situation: Adequacy In Meeting The Needs Of Students With Disabilities	Actual Situation		Desired Situation		Desired Situation: (It Would Be Helpful If ...)	Correlation Between Actual and Desired			Levene's Test Between Actual and Desired		
	Mean [1]	SD	Mean [1]	SD		Correlation	Sig	N	t	df	Sig
Inside & Outside The Institution Factors											
Funding											
Funding for institution's adaptive computer technologies	3.50	1.76	4.84	1.49	More funding for institution's adaptive computer technologies	0.446	0.001	143	-6.18	142	0.000
Inside The Institution Factors											
Access To Adaptive Computer Technologies											
Availability in specialized labs/centres	3.74	1.63	4.54	1.58	More equipment available in specialized labs/centres	0.256	0.007	111	-3.41	110	0.001
Physical space available for computer technologies	3.58	1.72	4.65	1.55	More physical space for equipment	0.503	0.000	119	-4.40	118	0.000
Training for students on adaptive computer technologies	3.17	1.68	4.99	1.46	A person to train students	0.392	0.000	107	-8.33	106	0.000
Availability in mainstream computer labs	2.81	1.72	4.82	1.43	Equipment available in more computer labs	0.402	0.000	140	-8.90	139	0.000
Support For Adaptive Computer Technologies											
Administration reacts positively concerning computer accessibility	4.25	1.42	4.63	1.60	If administration were to react more positively	0.494	0.000	128	-2.31	127	0.023
Opportunities for employers to learn about adaptive technologies	3.24	1.73	5.18	1.19	Professional development time to learn about adaptive technologies	0.169	0.045	142	-10.52	141	0.000
Specialist in adaptive computer technologies on campus	3.06	1.91	5.25	1.14	If there were a specialist in adaptive computer technologies on campus	0.047	0.600	125	-13.35	124	0.000
Computer support people can service adaptive technologies	3.00	1.73	5.10	1.31	If computer support people took responsibility for adaptive technologies	0.244	0.007	123	-9.95	122	0.000
Consulted when computer infrastructure decisions made	2.26	1.71	5.09	1.34	If consulted when computer infrastructure decisions made	0.257	0.002	146	-14.17	145	0.000
Advisory/steering committee deals with computer accessibility	2.20	1.82	4.48	1.61	Have multidisciplinary advisory/steering committee for adaptive computers	0.171	0.053	129	-12.30	128	0.000
Faculty And Computer Accessibility											
Computer-based teaching materials used by professors accessible	3.14	1.56	5.17	1.19	If computer-based teaching materials used by professors were more accessible	0.405	0.000	118	-9.71	117	0.000

Note: Boxed values denote items that are significant or approach significance

[1] Based on a 6-point scale, with higher scores indicating stronger agreement with the statement

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Table 18

Responses of Participants Whose Actual Situations Do Vs. Do Not Meet The Computer Related Needs Of Students

Desired Situation	Existing Situation Meets The Needs Of Students	N	Mean [1]	SD	t	df	Sig.
Inside and Outside The Institution Factors							
Funding							
More funding for institution's adaptive computer technologies	Yes	75	4.39	1.68	-3.99	141	0.000
	No	68	5.32	1.09			
Inside The Institution Factors							
Access To Adaptive Computer Technologies							
More equipment available in specialized labs/centres	Yes	68	4.25	1.70	-2.59	109	0.011
	No	43	4.98	1.24			
More physical space for equipment	Yes	66	4.12	1.70	-4.99	117	0.000
	No	53	5.34	0.92			
A person to train students	Yes	44	4.43	1.74	-3.35	105	0.001
	No	63	5.41	1.03			
Equipment available in more computer labs	Yes	53	4.21	1.77	-3.97	138	0.000
	No	87	5.16	1.08			
Support For Adaptive Computer Technologies							
concerning accessibility of computers on campus	Yes	91	4.22	1.72	-4.82	126	0.000
	No	37	5.62	0.64			
Professional development time to learn about adaptive technologies	Yes	71	5.03	1.40	-1.55	140	0.123
	No	71	5.34	0.92			
If there were a specialist in adaptive computer technologies on campus	Yes	45	5.20	1.34	-0.52	123	0.602
	No	80	5.31	1.04			
If computer support people took responsibility for adaptive technologies	Yes	50	4.88	1.48	-1.65	121	0.100
	No	73	5.27	1.18			
If consulted when computer infrastructure decisions made	Yes	37	4.65	1.74	-1.93	144	0.060
	No	109	5.24	1.16			
Have multidisciplinary advisory/steering committee for adaptive computer technologies	Yes	20	3.85	1.93	-1.82	127	0.071
	No	109	4.56	1.54			
Faculty And Computer Accessibility							
If computer-based teaching materials used by professors were more accessible	Yes	46	4.63	1.50	-3.44	116	0.001
	No	72	5.47	0.90			

Note. Boxed values denote items that are significant or approach significance.
[1] Based on a 6-point scale, with higher scores indicating stronger agreement with the statement.

Table 19

Table 19

Proportion of Participants Whose Actual Situation Does Vs. Does Not Meet The Computer Related Needs Of Students

Desired Situation	Existing Situation Meets The Needs Of Students	N	Percent
Inside and Outside The Institution Factors			
Funding			
Funding for institution's adaptive computer technologies	Yes	75	52%
	No	68	48%
Inside The Institution Factors			
Access To Adaptive Computer Technologies			
Availability in specialized labs/centres	Yes	68	61%
	No	43	39%
Physical space available for computer technologies	Yes	66	55%
	No	53	45%
Training for students on adaptive computer technologies	Yes	44	41%
	No	63	59%
Availability in mainstream computer labs	Yes	53	38%
	No	87	62%
Support For Adaptive Computer Technologies			
Administration reacts positively concerning computer accessibility	Yes	91	71%
	No	37	29%
Opportunities for employees to learn about adaptive technologies	Yes	71	50%
	No	71	50%
Specialist in adaptive computer technologies on campus	Yes	45	36%
	No	80	64%
Computer support people can service adaptive technologies	Yes	50	41%
	No	73	59%
Consulted when computer infrastructure decisions made	Yes	37	25%
	No	109	75%
Advisory/steering committee deals with computer accessibility	Yes	20	16%
	No	109	84%
Faculty And Computer Accessibility			
Computer-based teaching materials used by professors accessible	Yes	46	39%
	No	72	61%

Table 20

Table 20

Proportion of Participants Whose Actual Situation Does Vs. Does Not Meet The Computer Related Needs Of Students: Anglophone and Francophone Colleges and

	Existing Situation Meets The Needs Of Students	Anglophone Colleges		Anglophone Universities		Francophone Colleges		Francophone Universities	
		N	Percent	N	Percent	N	Percent	N	Percent
Funding									
Funding for institution's adaptive computer technologies	Yes	30	46%	22	50%	16	67%	7	88%
	No	35	54%	22	50%	8	33%	1	13%
Access To Adaptive Computer Technologies									
Availability in specialized labs/centres	Yes	26	57%	24	65%	10	59%	8	89%
	No	20	43%	13	35%	7	41%	1	11%
Physical space available for computer technologies	Yes	24	48%	22	58%	11	55%	7	78%
	No	26	52%	16	42%	9	45%	2	22%
Training for students on adaptive computer technologies	Yes	20	42%	9	28%	8	44%	7	88%
	No	28	58%	23	72%	10	56%	1	13%
Availability in mainstream computer labs	Yes	24	36%	10	24%	13	62%	5	56%
	No	42	64%	31	76%	8	38%	4	44%
Support For Adaptive Computer Technologies									
Administration reacts positively concerning computer accessibility	Yes	43	69%	23	64%	18	90%	6	86%
	No	19	31%	13	36%	2	10%	1	14%
Opportunities for employees to learn about adaptive technologies	Yes	33	52%	23	52%	9	39%	5	56%
	No	31	48%	21	48%	14	61%	4	44%
Specialist in adaptive computer technologies on campus	Yes	25	45%	11	32%	6	25%	1	11%
	No	30	55%	23	68%	18	75%	8	89%
Computer support people can service adaptive technologies	Yes	25	46%	11	30%	10	48%	4	44%
	No	29	54%	26	70%	11	52%	5	56%
Consulted when computer infrastructure decisions made	Yes	12	18%	11	25%	6	25%	6	60%
	No	53	82%	33	75%	18	75%	4	40%
Advisory/steering committee deals with computer accessibility	Yes	8	13%	7	21%	3	13%	2	22%
	No	52	87%	27	79%	21	88%	7	78%
Faculty And Computer Accessibility									
Computer-based teaching materials used by professors accessible	Yes	13	27%	14	40%	13	59%	6	67%
	No	36	73%	21	60%	9	41%	3	33%

Table 21

Table 21

Wish List Of Personnel Providing Services To Students With Disabilities In Rank Order

Desired Situation (It Would Make My Job Easier If ...)	N	Mean	Std Dev	Rank
All Respondents				
If students were knowledgeable computer users	151	5.43	0.93	1
If students were able to get subsidized computer technologies for home use more easily	146	5.33	1.06	2
If there were a specialist in adaptive computer technologies on campus	130	5.28	1.14	3
If students had adequate access to computers off campus	144	5.25	1.11	4
Professional development time to learn about adaptive technologies	143	5.18	1.19	5
If computer-based teaching materials used by professors were more accessible	132	5.17	1.19	6
If computer support people took responsibility for adaptive technologies	133	5.10	1.31	7
If consulted when computer infrastructure decisions made	148	5.09	1.34	8
If organizations that provide students with technologies were to work cooperatively	146	5.01	1.36	9
A person to train students	114	4.99	1.46	10
More funding for institution's adaptive computer technologies	145	4.84	1.49	11
Equipment available in more computer labs	147	4.82	1.43	12
More physical space for equipment	122	4.65	1.55	13
If administration were to react more positively concerning accessibility of computers on campus	131	4.63	1.60	14
More equipment available in specialized labs/centres	119	4.54	1.58	15
Have multidisciplinary advisory/steering committee for adaptive computer technologies	132	4.48	1.61	16
Respondents Who Indicated That The Current Situation Did Not Meet The Needs Of Students with Disabilities [1]				
If administration were to react more positively concerning accessibility of computers on campus	37	5.62	0.64	1
If computer-based teaching materials used by professors were more accessible	72	5.47	0.90	2
A person to train students	63	5.41	1.03	3
More physical space for equipment	53	5.34	0.92	4
Professional development time to learn about adaptive technologies	71	5.34	0.92	5
More funding for institution's adaptive computer technologies	68	5.32	1.09	6
If there were a specialist in adaptive computer technologies on campus	80	5.31	1.04	7
If computer support people took responsibility for adaptive technologies	73	5.27	1.18	8
If consulted when computer infrastructure decisions made	109	5.24	1.16	9
Equipment available in more computer labs	87	5.16	1.08	10
More equipment available in specialized labs/centres	43	4.98	1.24	11
Have multidisciplinary advisory/steering committee for adaptive computer technologies	109	4.56	1.54	12

[1] Responses of those participants whose answers to the "paired" question was <=3 (i.e., below the mid point of the scale)
There were no "pairs" for 4 items
- If students were able to get subsidized technologies for home use more easily;
- If students had adequate access to computers off campus;
- If students were knowledgeable computer users;
- If organizations that provide students with technologies were to work cooperatively

Table 22

Anglophone and Francophone Colleges and Universities

	Anglophone institutions						Francophone institutions						ANOVA		
	Colleges			Universities			Colleges			Universities			df	Main Effect		Interaction
External Structure (I Would Make My Job Easier If I	N	Mean[1]	SD	Rank	N	Mean[1]	SD	Rank	N	Mean[1]	SD	Rank	N	Mean[1]	SD	Rank		Language	Institution	
Have my grades available in centralized location	56	5.08	1.27	12	55	4.61	1.52	11	18	3.83	1.76	15	9	2.44	1.01	16	(1110)	26.69***	7.90**	2.04
Have physical space for equipment	42	4.95	1.33	14	35	5.03	1.37	14	21	3.90	1.57	14	3	3.11	1.05	10	(1110)	20.42***	1.23	1.70
Always have available	51	5.10	1.03	10	55	5.07	1.03	10	18	4.50	1.57	11	8	3.75	1.49	12	(1130)	32.89***	3.72+	14.31***
Have training for instructors/support people for technologies	51	5.02	1.29	11	51	5.10	1.15	11	25	4.52	1.76	10	5	2.73	1.64	13	(1139)	20.20***	6.91**	8.63**
Have software available in more computer labs	57	5.07	1.11	13	44	5.27	1.09	9	24	4.04	1.85	13	3	2.56	1.11	15	(1140)	46.68***	5.53*	9.46**
Have computer-based teaching materials used by professors more route accessible	60	5.10	0.93	7	55	5.78	0.47	1	23	4.57	1.19	9	9	3.78	1.72	8	(1125)	30.31***	0.15	8.45**
Have labs of the computer infrastructure for classroom needs	57	5.12	1.25	9	51	5.68	0.92	4	23	4.56	1.72	8	10	3.80	1.81	7	(1141)	22.10***	0.18	6.85**
Have professional development time to learn about adaptive technologies	54	5.34	0.82	4	44	5.23	1.27	11	24	5.04	1.46	5	9	4.11	1.53	4	(1130)	7.67**	4.18*	2.53
Have reliable delivery, networking connection for adaptive computer technologies	62	4.58	1.41	16	55	4.69	1.47	17	24	4.29	1.85	12	9	2.56	1.07	14	(1126)	15.29***	4.17*	8.64**
Have administration aware it must move primarily responsibility to complete on campus	61	4.79	1.45	15	57	5.38	0.98	6	21	3.48	1.83	16	7	2.86	1.46	11	(1128)	30.93***	0.00	3.04+
Have computer support people look responsibility for adaptive technologies	60	5.22	1.39	6	53	5.89	0.62	2	23	4.57	1.44	8	10	3.80	1.79	9	(1127)	27.99***	1.80	7.65**
Have work in networked in adaptive computer technologies on campus	58	5.26	1.17	5	55	5.83	0.65	3	24	5.13	1.15	3	10	4.40	1.78	1	(1125)	8.17**	0.60	4.99*
Have labs were accessible computer rooms	66	5.65	0.72	1	49	5.80	0.78	5	26	5.15	0.97	2	9	3.89	1.45	5	(1144)	35.55***	12.25***	12.13***
Have both full adequate access to computers on campus	60	5.48	0.81	3	51	5.26	1.27	10	24	5.08	1.16	4	9	3.88	1.64	6	(1137)	12.82***	8.24**	4.46*
Have policy plans that provide students with technologies more to work cooperatively	60	5.18	1.23	8	52	5.14	1.24	12	26	4.58	1.70	7	9	4.33	1.58	2	(1136)	5.62*	0.23	0.12
Have labs were able to get networked computer technologies for home use more easily	64	5.47	0.84	2	47	5.42	1.02	7	26	5.19	1.02	1	11	4.27	1.90	3	(1111)	11.29***	5.28*	4.21*
MANOVA																	(1643)	5.36***	1.91*	2.05**

Note: Unless noted otherwise, MANOVA terms (Wilkinson F ratios) are for univariate ANOVAs

[1] Based on a 6-point scale, with higher scores indicating stronger agreement with the statement

[2] Rewarded on all requirements

*** p<.001 ** p<.01 * p<.05 + p<.10

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Table 23

Table 23
Wish Lists Of Personnel Providing Services To Students With Disabilities In Anglophone and Francophone

Desired Situation (It Would Make My Job Easier If...)	Rank
Anglophone Colleges	
If students were knowledgeable computer users	1
If students were able to get subsidized computer technologies for home use more easily	2
If students had adequate access to computers off campus	3
Professional development time to learn about adaptive technologies	4
If there were a specialist in adaptive computer technologies on campus	5
If computer support people took responsibility for adaptive technologies	6
If computer-based teaching materials used by professors were more accessible	7
If organizations that provide students with technologies were to work cooperatively	8
If consulted when computer infrastructure decisions made	9
A person to train students	10
Equipment available in more computer labs	11
More equipment available in specialized labs/centres	12
More funding for institution's adaptive computer technologies	13
More physical space for equipment	14
If administration were to react more positively concerning accessibility of computers on campus	15
Have multidisciplinary advisory/steering committee for adaptive computer technologies	16
Anglophone Universities	
If computer-based teaching materials used by professors were more accessible	1
If consulted when computer infrastructure decisions made	2
A person to train students	3
If there were a specialist in adaptive computer technologies on campus	4
If students were knowledgeable computer users	5
If computer support people took responsibility for adaptive technologies	6
If students were able to get subsidized computer technologies for home use more easily	7
If administration were to react more positively concerning accessibility of computers on campus	8
Equipment available in more computer labs	9
If students had adequate access to computers off campus	10
Professional development time to learn about adaptive technologies	11
If organizations that provide students with technologies were to work cooperatively	12
More funding for institution's adaptive computer technologies	13
More physical space for equipment	14
Have multidisciplinary advisory/steering committee for adaptive computer technologies	15
More equipment available in specialized labs/centres	16
Francophone Colleges	
If students were able to get subsidized computer technologies for home use more easily	1
If students were knowledgeable computer users	2
If there were a specialist in adaptive computer technologies on campus	3
If students had adequate access to computers off campus	4
Professional development time to learn about adaptive technologies	5
If consulted when computer infrastructure decisions made	6
If organizations that provide students with technologies were to work cooperatively	7
If computer support people took responsibility for adaptive technologies	8
If computer-based teaching materials used by professors were more accessible	9
More funding for institution's adaptive computer technologies	10
A person to train students	11
Have multidisciplinary advisory/steering committee for adaptive computer technologies	12
Equipment available in more computer labs	13
More physical space for equipment	14
More equipment available in specialized labs/centres	15
If administration were to react more positively concerning accessibility of computers on campus	16
Francophone Universities	
If there were a specialist in adaptive computer technologies on campus	1
If organizations that provide students with technologies were to work cooperatively	2
If students were able to get subsidized computer technologies for home use more easily	3
Professional development time to learn about adaptive technologies	4
If students were knowledgeable computer users	5
If students had adequate access to computers off campus	6
If consulted when computer infrastructure decisions made	7
If computer-based teaching materials used by professors were more accessible	8
If computer support people took responsibility for adaptive technologies	9
More physical space for equipment	10
If administration were to react more positively concerning accessibility of computers on campus	11
A person to train students	12
More funding for institution's adaptive computer technologies	13
Have multidisciplinary advisory/steering committee for adaptive computer technologies	14
Equipment available in more computer labs	15
More equipment available in specialized labs/centres	16

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Table 24

Table 24

Faculty and Staff With Disabilities In Colleges and Universities in Canadian Provinces And Territories

Province	Institution	N	Number of Employees With Disabilities		Total Student Enrollment		Proportion Of Employees With Disabilities[1]	
			Mean	td. Deviation	Mean	Std. Deviation	Mean	3td. Deviation
Alberta	College	11	3.91	3.83	6910.79	8297.40	2.67 / 1000	5.72 / 1000
	University	1	100.00	.	19666.67	12342.34	3.33 / 1000	
	Total	12	11.92	27.98	9161.82	10005.22	2.72 / 1000	5.46 / 1000
British Columbia	College	6	14.50	11.95	9397.17	9207.293	2.40 / 1000	2.84 / 1000
	University	5	62.60	78.57	14977.00	12919.51	5.21 / 1000	6.40 / 1000
	Total	11	36.36	56.32	11933.45	10846.37	3.68 / 1000	4.75 / 1000
Manitoba	College	4	11.00	20.02	8911	15789.21	1.13 / 1000	0.91 / 1000
	Total	4	11.00	20.02	8911	15789.21	1.13 / 1000	0.91 / 1000
New Brunswick	College	3	1.33	2.31	716.6667	678.85	0.89 / 1000	1.54 / 1000
	University	3	7.33	6.66	4573.333	3971.92	6.87 / 1000	9.82 / 1000
	Total	6	4.33	5.54	2645	3310.13	3.88 / 1000	7.09 / 1000
Newfoundland	College	4	2.75	3.59	1995	2349.21	3.27 / 1000	4.18 / 1000
	University	1	3.00	.	16000	.	0.19 / 1000	
	Total	5	2.80	3.11	4796	6585.37	2.65 / 1000	3.87 / 1000
Nova Scotia	University	5	12.60	11.01	5561.2	4642.98	2.65 / 1000	2.92 / 1000
	Total	5	12.60	11.01	5561.2	4642.98	2.65 / 1000	2.92 / 1000
Ontario	College	14	17.29	25.61	6873.143	4847.88	3.49 / 1000	5.16 / 1000
	University	13	22.85	35.15	12606.46	10693.30	2.34 / 1000	3.02 / 1000
	Total	27	19.96	30.11	9633.63	8546.84	2.94 / 1000	4.22 / 1000
Prince Edward Islan	College	2	0.00	0.00	1120	1527.35	0.00 / 1000	0.00 / 1000
	Total	2	0.00	0.00	1120	1527.35	0.00 / 1000	0.00 / 1000
Québec	College	22	1.82	2.13	3216.364	1854.94	0.68 / 1000	0.91 / 1000
	University	6	3.67	3.83	14083.33	16731.34	0.40 / 1000	0.47 / 1000
	Total	28	2.21	2.62	5545	8668.08	0.62 / 1000	0.83 / 1000
Saskatchewan	College	1	0.00	.	300	.	0.00 / 1000	
	University	1	48.00	.	12000	.	4.00 / 1000	
	Total	2	24.00	33.94	6150	8273.15	2.00 / 1000	2.83 / 1000
Territories (All)	College	2	13.00	16.97	800	848.53	11.43 / 1000	9.09 / 1000
	Total	2	13.00	16.97	800	848.53	11.43 / 1000	9.09 / 1000
Distance Ed	Distance Ec	2	2.82	2.00	10000	7071.07	0.13 / 1000	0.19 / 1000
	Total	2	2.82	2.00	10000	7071.07	0.13 / 1000	0.19 / 1000
Total	College	69	7.20	14.34	5188.87	6618.17	2.18 / 1000	4.11 / 1000
	University	35	24.80	41.43	12079.86	11304.55	2.86 / 1000	4.29 / 1000
	Distance Ec	2	2.00	2.83	10000.00	7071.07	0.13 / 1000	0.19 / 1000
	Total	106	12.92	27.57	7554.97	8991.12	2.37 / 1000	4.13 / 1000

[1] Proportions are calculated by dividing the number of employees by the total student enrollment (i e , n employees with disabilities per 1000 students).

Table 25

Faculty and Staff With Disabilities At Anglophone and Francophone Colleges and Universities in Colleges And Universities in Canadian Provinces And Territories

Existing Situation	Whole Sample			College						University						ANOVA[1]		
				Anglophone			Francophone			Anglophone			Francophone			df	Main Effect F		Interaction F
	N	Mean[1]	SD	N	Mean[1]	SD	N	Mean[1]	SD	N	Mean[1]	SD	N	Mean[1]	SD		Language	Institution	
Number of employees with disabilities at respondent's institution	108	13	26	42	10.83	17.45	27	1.56	1.91	28	32.23	45.91	9	3.13	3.48	(1,99)	9.95**	3.56+	2.65
Proportion of employees with disabilities at respondent's institution	108	2.37/1000	4.13/1000	42	2.69/1000	4.25/1000	27	1.14/1000	1.93/1000	28	3.73/1000	4.68/1000	9	0.36/1000	0.43/1000	(1,99)	5.73*	0.00	1.19

[1] Based on a 6-point scale with higher scores indicating stronger agreement with the statement.
[2] Proportions are calculated by dividing the number of employees by the total student enrollment.
*** p< .001 ** p< .01 * p< .05 + p< .10

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Table 26

Table 26

Faculty and Staff With Disabilities: Computer Related Needs Met By Respondent Or His/Her Office

Variable		Whole Sample		College				University			
				Anglophone		Francophone		Anglophone		Francophone	
		N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Computer related services are provided to employees with disabilities by the office for services to students with disabilities	Yes	26	23%	14	27%	7	20%	4	24%	1	13%
	No	86	77%	38	73%	28	80%	13	76%	7	88%

Table 27

Table 27

Who Does Or Is Supposed To Provide Computer Related Services To Faculty and Staff With Disabilities?

Response	Responses[1]		
	Rank	Number	Percent
Human resources	1	37	37%
Employee's department	2	13	13%
Employee himself or herself	3	10	10%
Don't know	4	8	8%
Computer services	5	7	7%
Institution's administration	6	6	6%
Employment equity/human rights committee	6	6	6%
Rehabilitation services external to the institution	7	5	5%
Occupational health and safety	8	4	4%
Disability and accommodation office for staff	9	1	1%
Dean of faculty	9	1	1%
Dean of student services	9	1	1%
Grant	9	1	1%

[1] 100 responses made by the 86 (77%) participants who indicated that computer related services for employees with disabilities are not provided by the office for services to students with disabilities. 26 (23%) participants indicated that services are provided by their office.

APPENDIX B - FIGURES

Figure 1

Figure 1

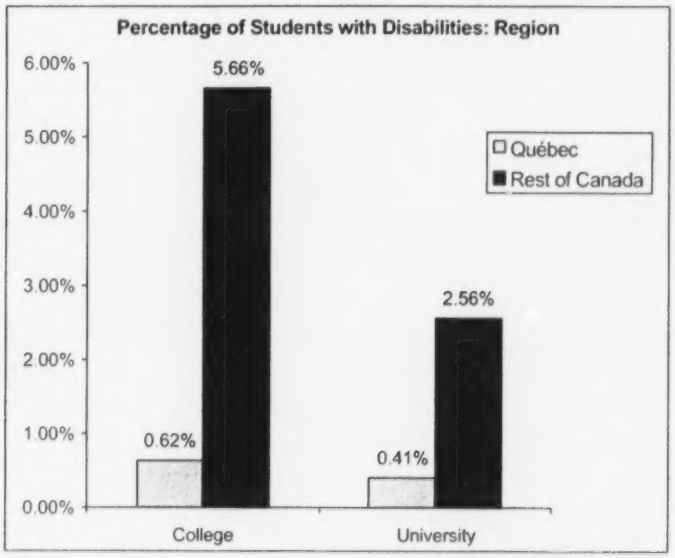


Figure 2

Figure 2

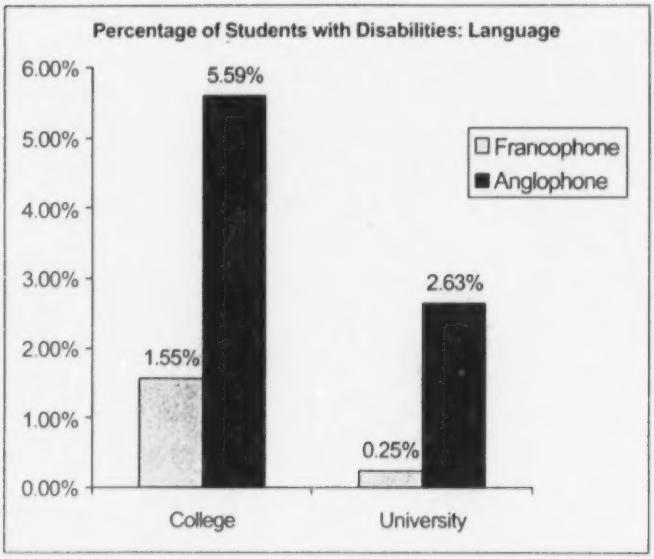


Figure 3

Figure 3

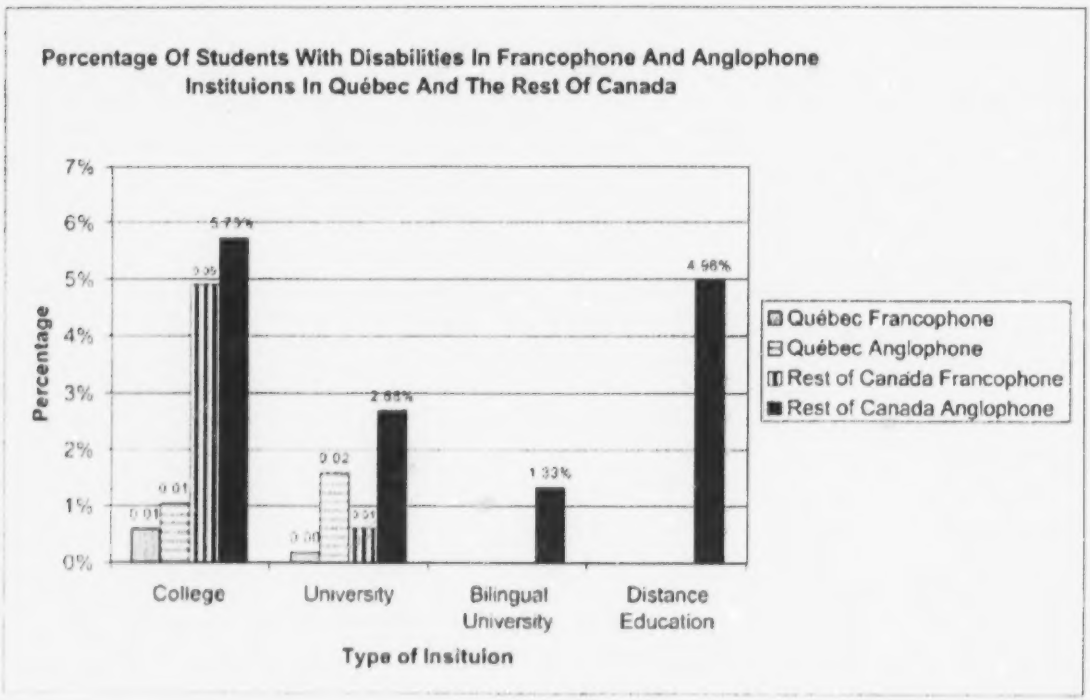
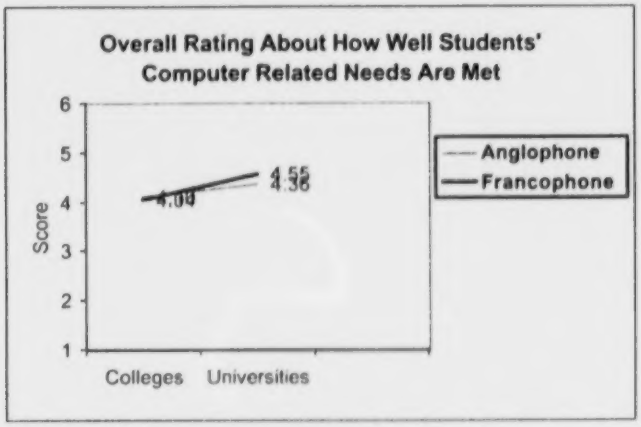


Figure 4 (A – C)

Figure 4

"Actual Situation:" Adequacy Of Various Aspects Of Computer Technologies At Anglophone and Francophone Colleges and Universities In Meeting The Computer Related Needs Of Students With Disabilities

a



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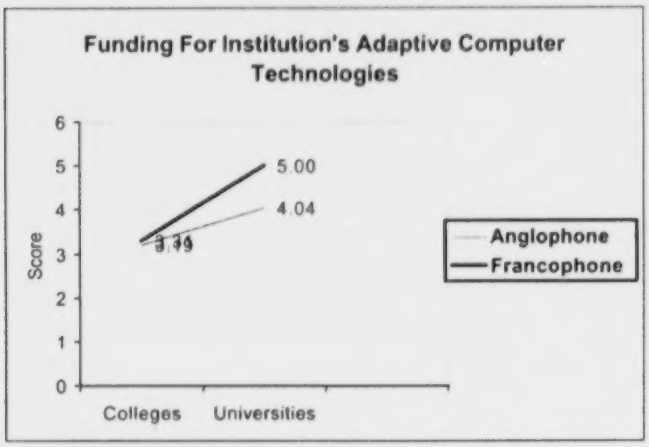

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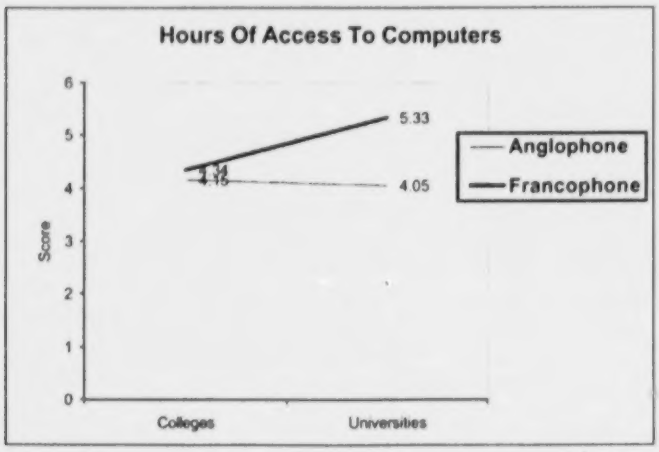
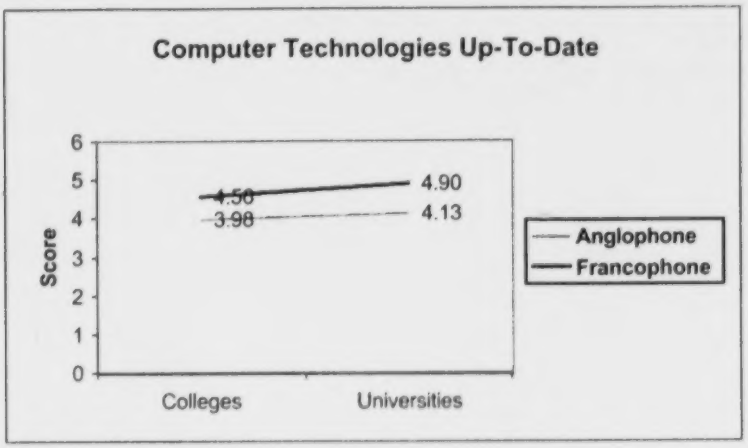


Figure 4 (D – F)

Figure 4

d



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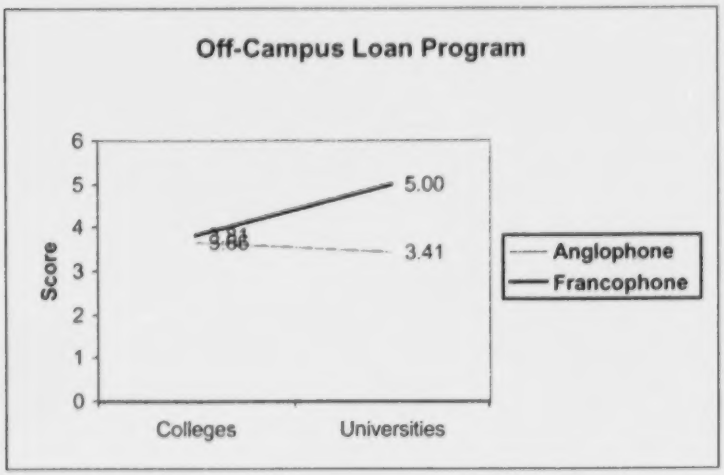

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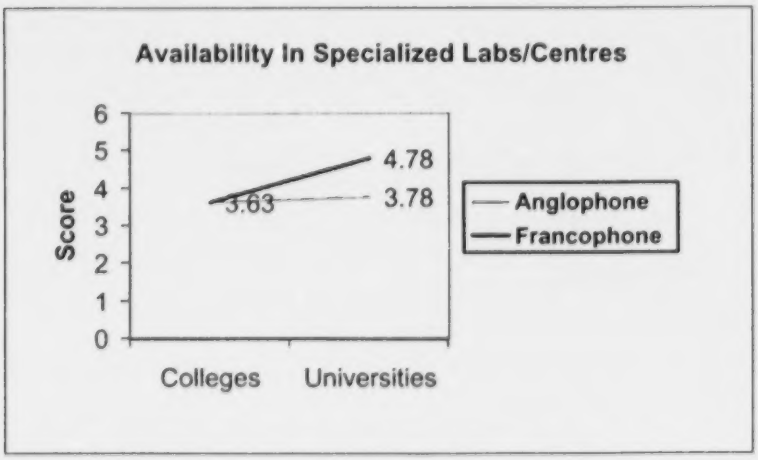
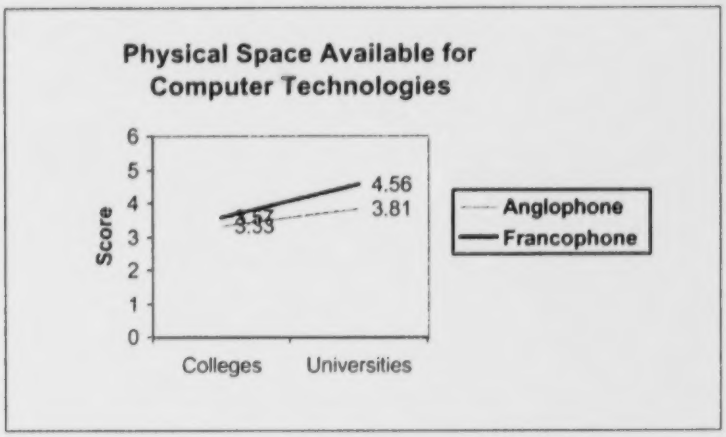


Figure 4 (G – I)

Figure 4

g



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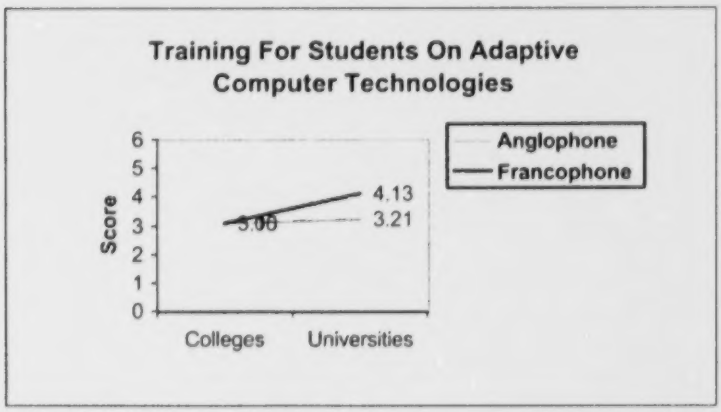

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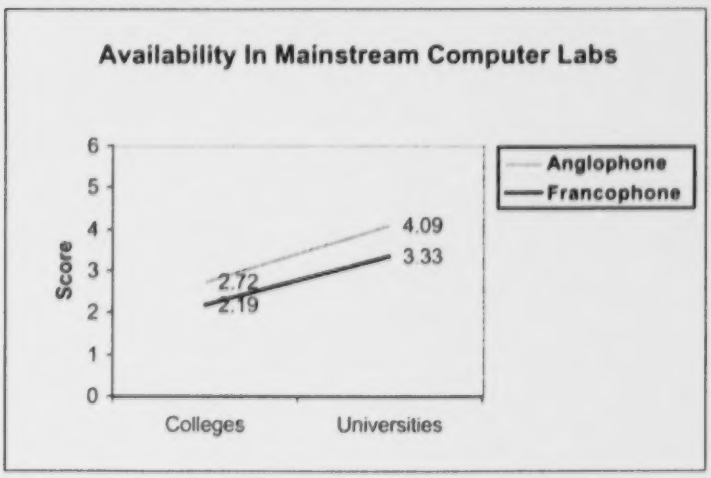
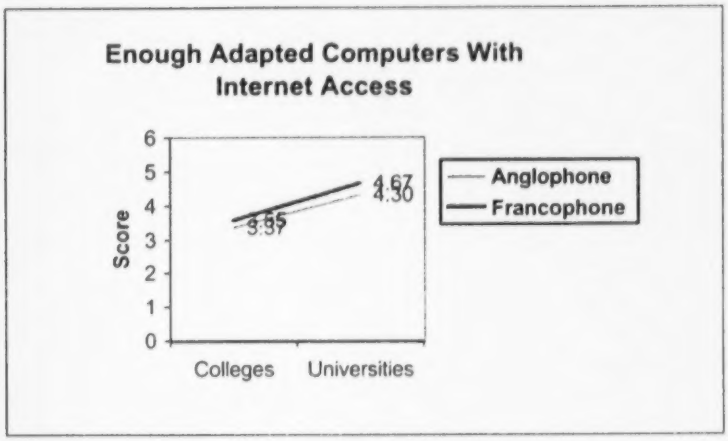


Figure 4 (J – L)

Figure 4

j



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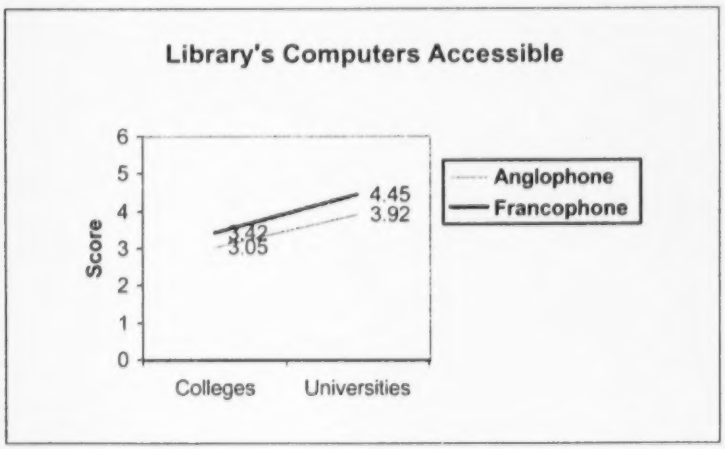

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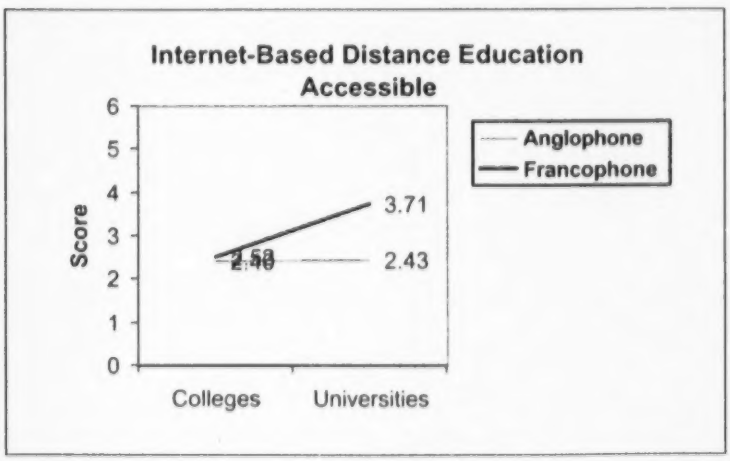

Figure 4 (M – O)

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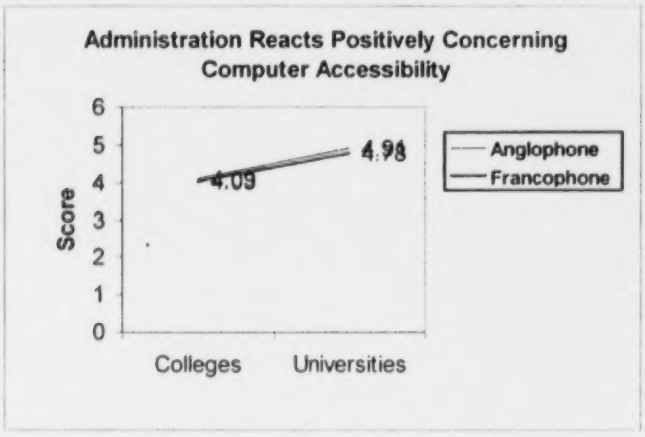

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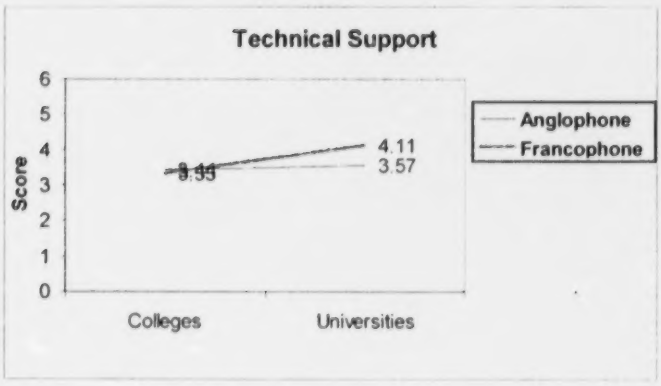

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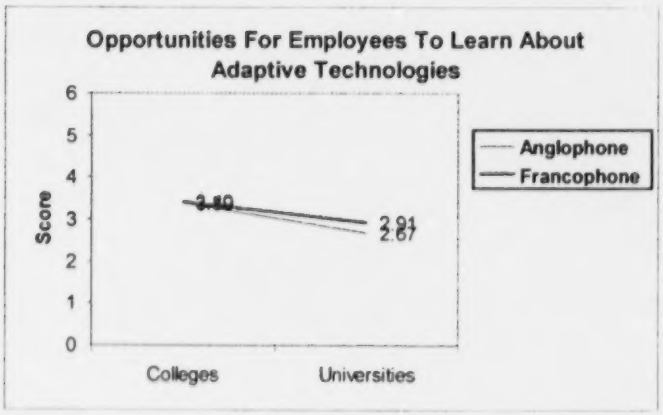
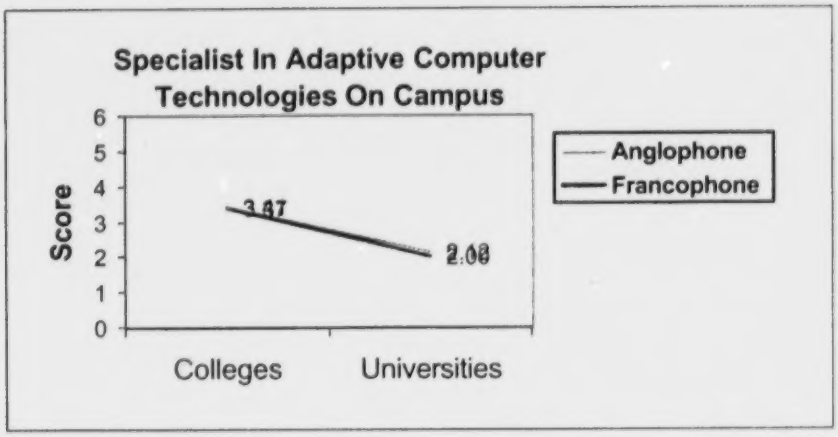


Figure 4 (P – R)

Figure 4

p



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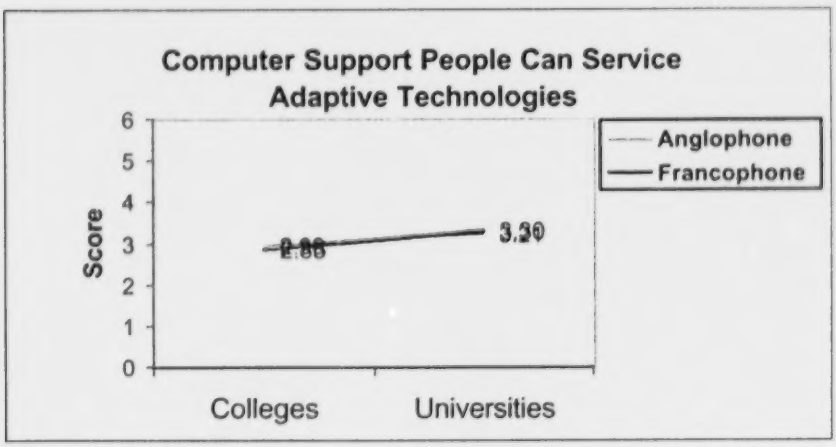

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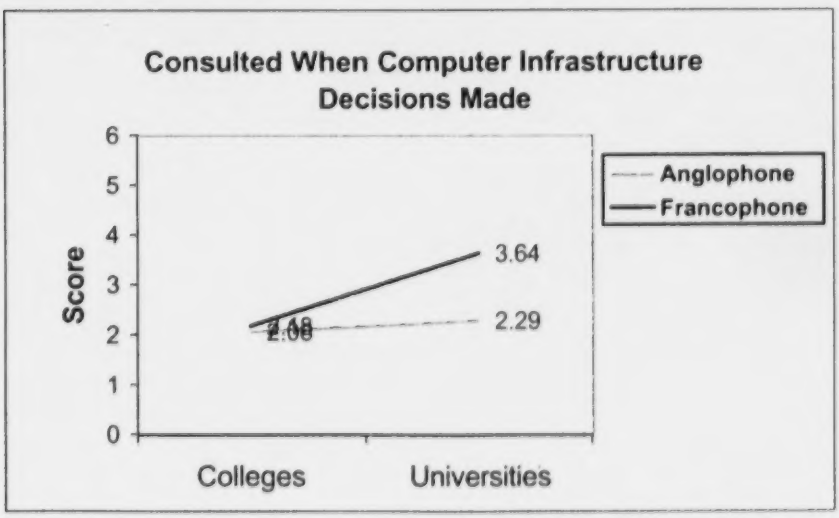

Figure 4 (S – U)

Figure 4

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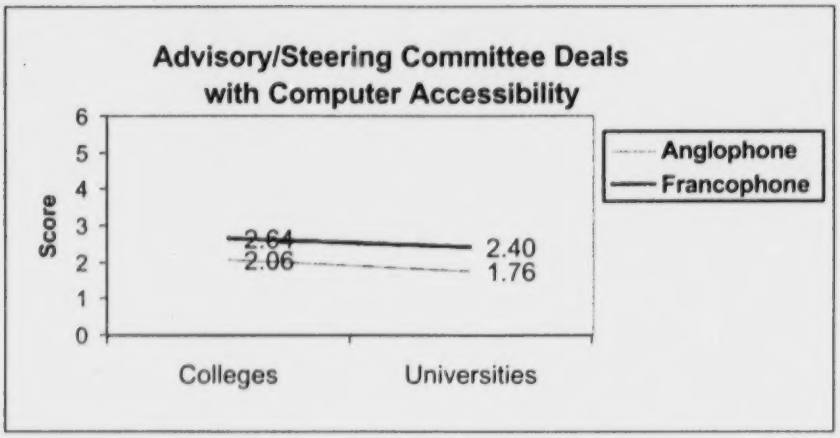

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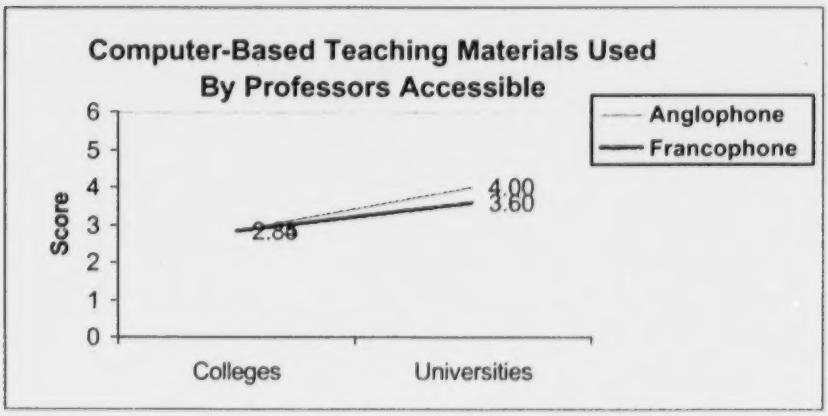

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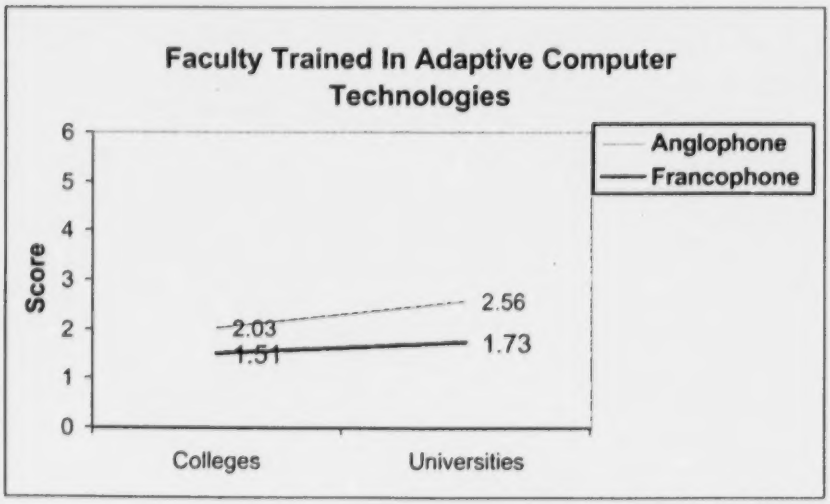
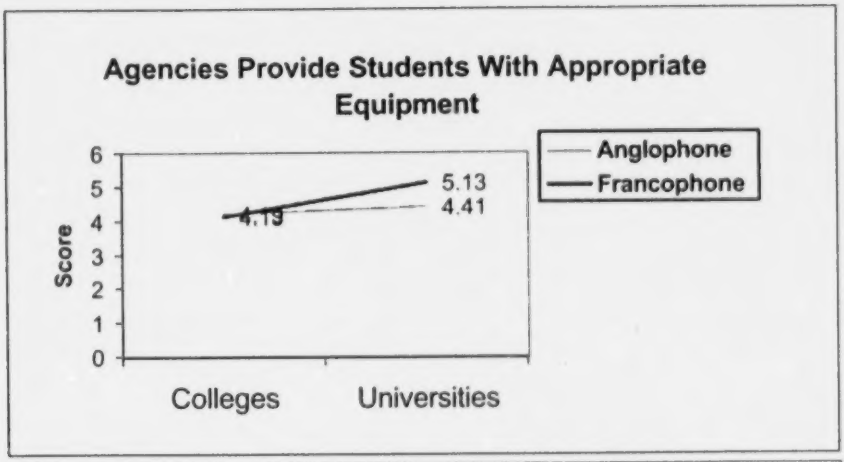


Figure 4 (V – W)

Figure 4

v



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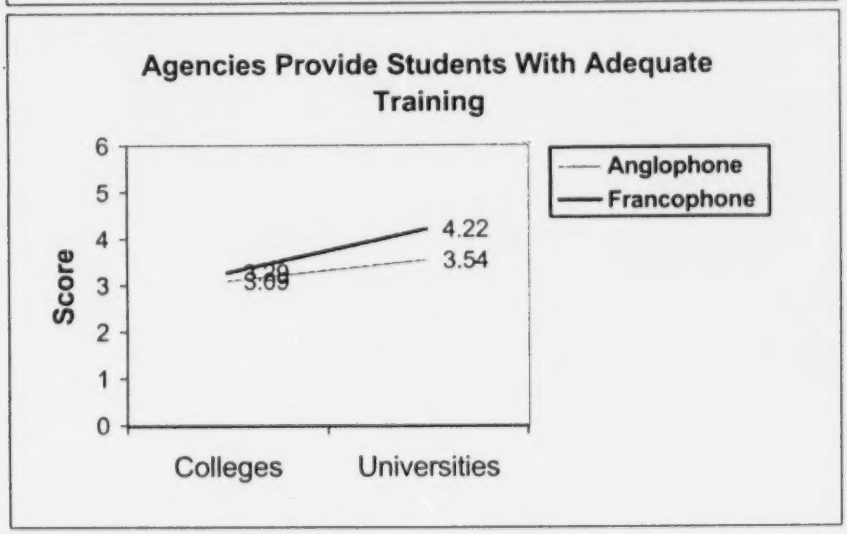
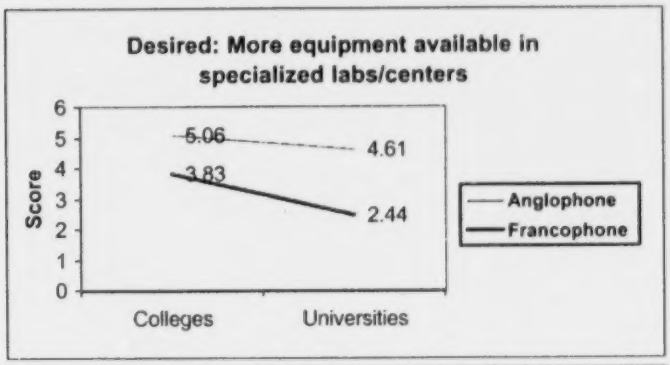


Figure 5 (A – C)

Figure 5

Wish Lists Of Disability Service Providers In Anglophone and Francophone Colleges and Universities: Interaction Between Language and Insituion In I Situations

a



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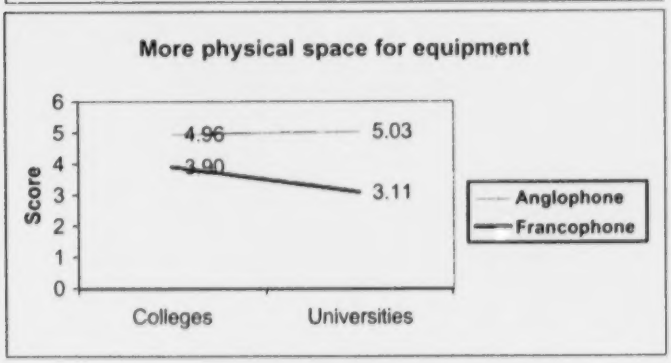

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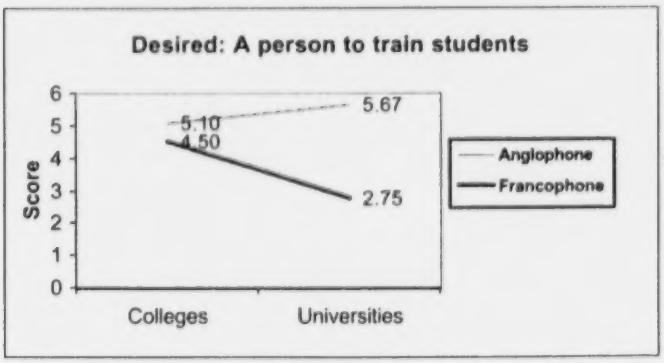
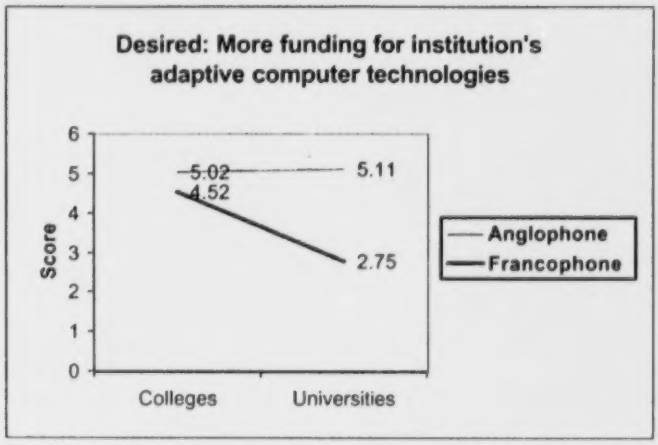


Figure 5 (D – F)

Figure 5

d



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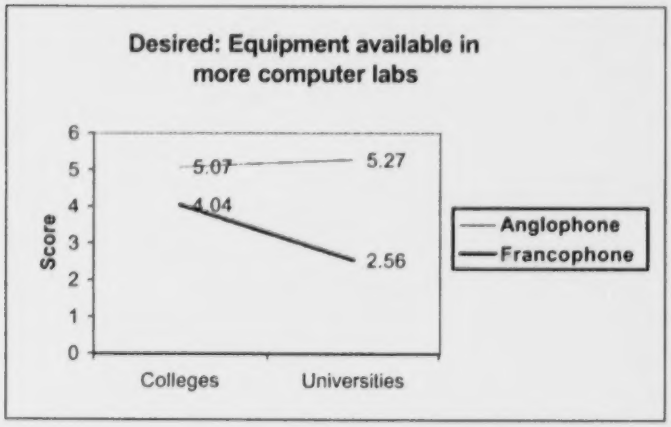

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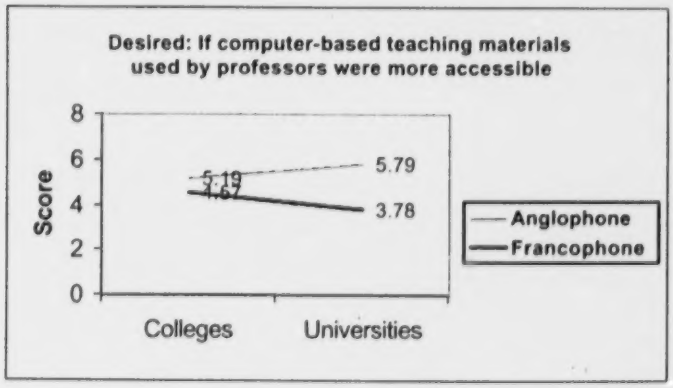
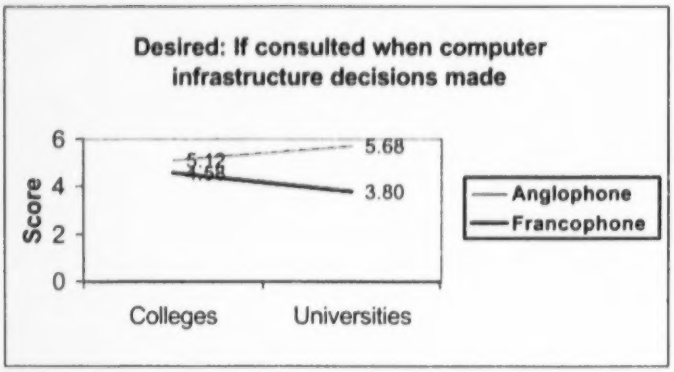


Figure 5 (G – I)

Figure 5

g



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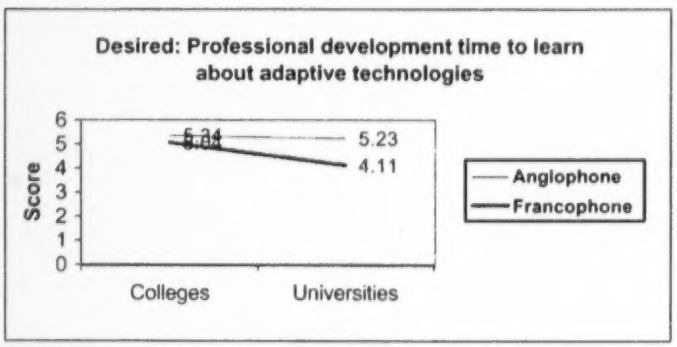

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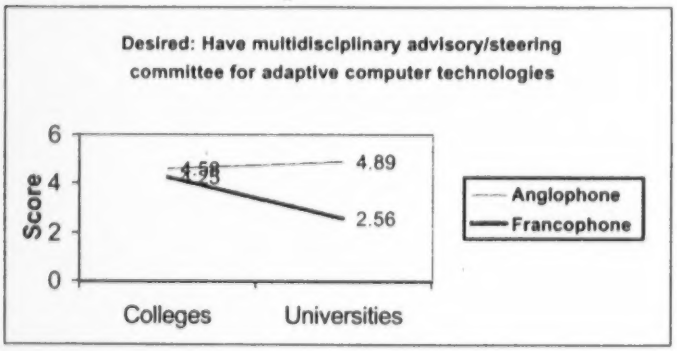
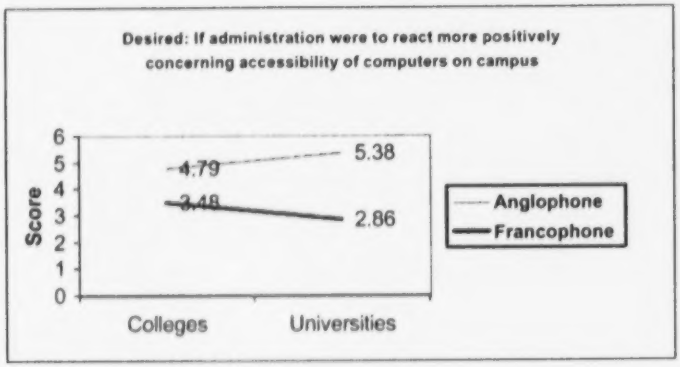


Figure 5 (J – L)

Figure 5

j



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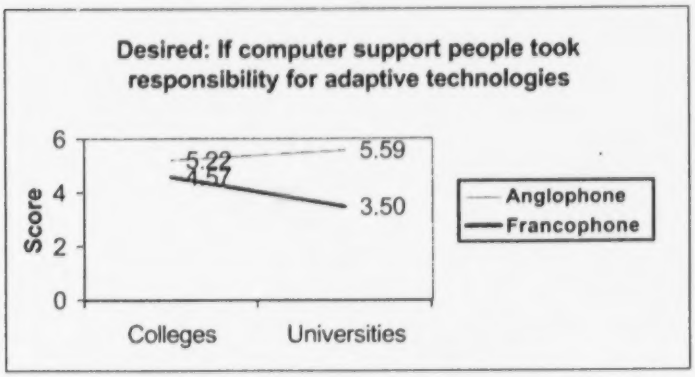

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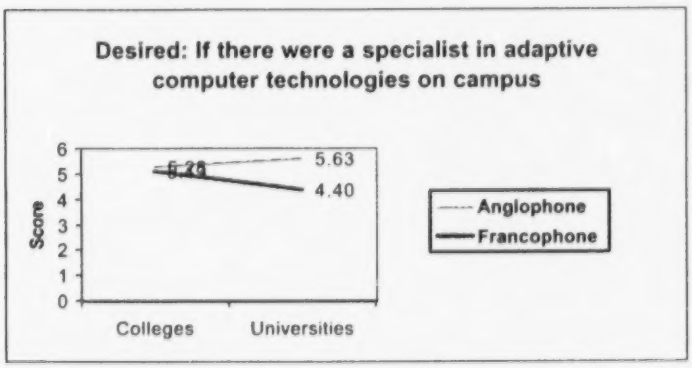
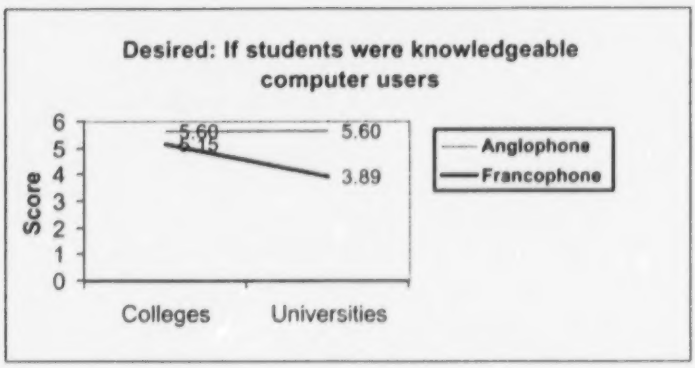


Figure 5 (M – O)

Figure 5

m



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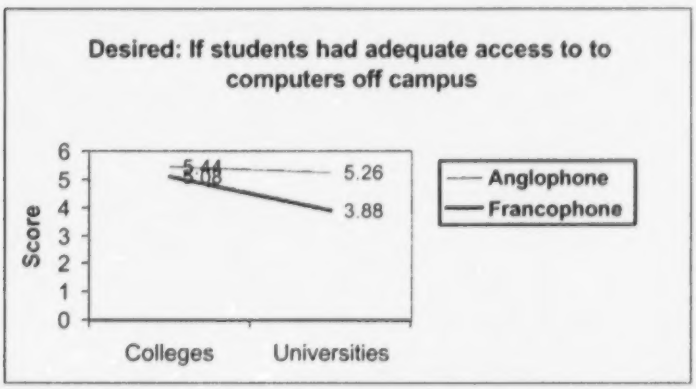


o

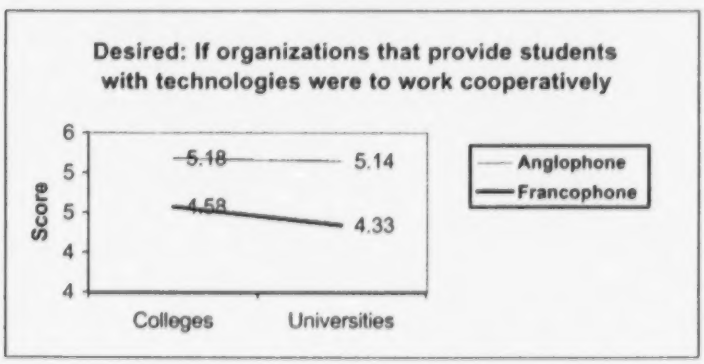
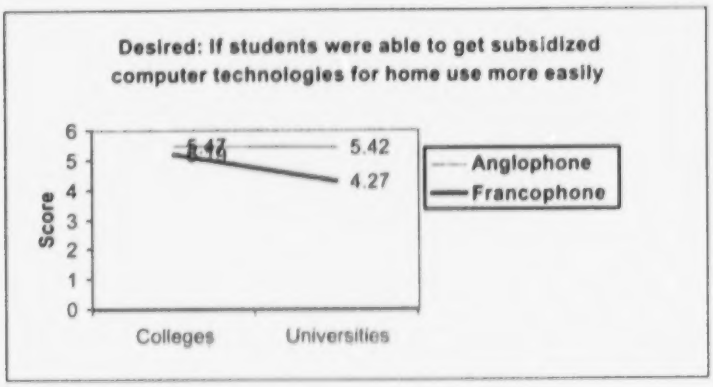


Figure 5 (P)

Figure 5

p



APPENDIX C - Structured Interview Protocol

English Consent Form

Adaptech Project
Dawson College
3040 Sherbrooke St. West
Montreal, QC, Canada
H3Z 1A4

(514) 931-8731
Spring, 2000

INFORMED CONSENT FOR THE COMPUTER ACCESSIBILITY SCALE FOR POSTSECONDARY EDUCATION STUDY

1. The purpose of this grant funded investigation is to evaluate computer and/or adaptive computer technologies in the postsecondary education of students with disabilities.

2. I understand that I am asked to participate in a telephone interview to be scheduled at a time convenient to me. This interview will be concerned with computer, information and adaptive technologies in the postsecondary context. I understand that all information I provide will be kept strictly confidential and will not be used for any purposes other than this study.

3. I understand that I am free to ask any questions concerning the methodology of this study at any time. If for any reason I experience any discomfort or concern during my participation in this project, I understand I am free to discuss this with the project's directors, Dr. Catherine Fichten (514-931-8731 ext. 1546; e-mail: md71@musica.mcgill.ca) and Ms. Maria Barile (514-931-8731 ext. 3586; e-mail: mdb2@musica.mcgill.ca). I acknowledge that I am free to participate or not, and that I have the option of terminating my participation in this study at any time.

4. I understand that if results of this study are published, any information I provide will remain strictly confidential, and that my privacy will be completely protected. I understand that any statements I make will never be linked to either myself or to my institution.

5. I understand that by responding to the interview questions I agree to have the data I provide included in the study on the use and the utility of computer technologies in the postsecondary education of students with disabilities.

English Interview Questions

COMPUTER ACCESSIBILITY SCALE FOR POSTSECONDARY EDUCATION

Goals

The overall objective of these questions is to obtain an overview of experiences of individuals who provide services to students with disabilities in postsecondary education. Specific goals include finding out about: (1) institutional arrangements for computer related accommodations for students with disabilities on campus, (2) institutional and external factors that help or hinder access to computer and/or adaptive computer technologies for students with disabilities, and (3) what could be done to improve the working lives of personnel providing services to students with disabilities when it comes to computer related accommodations.

The difference between this study and our previous research is that our current focus is on individuals who provide services to students with disabilities at the postsecondary level. Our previous work was focused on the needs and concerns of the students themselves.

Instructions

When we discuss the "services" you or your office/service provide, I am referring to computer-related services only and not to all the services provided to students with disabilities at your institution. Also, when I say "adaptive and/or mainstream computer technologies" we are making reference to technologies that are specifically computer-related. We do not mean FM systems, four-track tape recorders or note takers. We define adaptive computer technology as adaptive hardware (e.g., an adapted mouse) or adaptive software (e.g., software that enlarges what is on the screen).

If I use the term "student" without qualifying it further, I still mean students with disabilities/special needs.

Certain questions ask about "your institution." If you are a coordinator/director who looks after the entire institution, please base your answers on the whole school. However, if you are a coordinator/director of a specific campus or area, base your responses on the campus or area that you are responsible for.

I will ask about such things as "mainstream computer laboratories" or "mainstream" computers. When I do so, we are asking about the laboratories or computers that are intended for the general student population and not those intended specifically for students with disabilities.

We do not expect you to have detailed knowledge about computers or to have concrete answers to all of our questions. When terms like "I have the sense that" or "approximately" appear in questions, or when we ask for your "impressions" we are looking for your global perspective about issues rather than specific details.

General Information

0. ____ Participant number

1. ____ Name of institution and/or campus you are responsible for_____

2. ____ City and province _____

3. á. ___ Do you have any computer or adaptive computer technologies intended for students with disabilities on campus? Yes/No

If yes to item "a":

b. ___ Does a provincial/regional loan program supply some of the computer and/or adaptive computer technologies for your institution? Yes/No

Computer Technologies

In the following section, we refer to meeting the computer and/or adaptive computer technology needs of students with disabilities. Although we realize that there are a number of ways to do this, here we are not interested in meeting the needs of students through help provided by human assistants/attendants. Instead, we are interested in how well the technology itself meets the needs of students. For example, when students need to read documents on a computer, we want to know if there are ways for them to do so independently of a human assistant/attendant.

Rate your level of agreement with the following statements. Use a 6-point scale with:

1 = strongly disagree
2 = moderately disagree
3 = slightly disagree
4 = slightly agree
5 = moderately agree
6 = strongly agree

Do not spend too much time on any one statement but give the answer which best describes how you generally feel. If an item is not applicable, please respond with "not applicable"

4. ____ Overall, the computer and/or adaptive computer technology needs of students with disabilities at my institution are adequately met

If you do not have any computer and/or adaptive computer technologies intended for students with disabilities on campus, go to number 14.

Adaptive Computer Technologies On Campus

5. ____ ***If you have a provincial/regional computer technologies loan program:*** Overall, the resources provided for my institution by a provincial/regional loan program *meet the needs of students with disabilities* ("not applicable" if you don't have such a program)

6. ____ At my institution, computer and/or adaptive computer technologies are sufficiently up-to-date to *meet the needs of students with disabilities*

7. ____ At my institution, the hours of access to adaptive computer technologies *meet the needs of students with disabilities*

8. ____ My school's loan program of computer and/or adaptive computer technologies for off-campus use *meets the needs of students with disabilities*

9. ____ At my institution, there are enough computers with internet access that also have adaptive hardware/software on them to *meet the needs of students with disabilities*

10. ____ The technical support at my institution for students using adaptive computer technologies *meets the needs of students with disabilities*

11. a. ___ The availability of adaptive computer technologies in specialized labs/centres for students with disabilities at my institution *meets their needs*
    b. ___ *It would make my job easier* if there were more adaptive computer technologies available in specialized labs/centres at my institution

12. a. ___ The physical space available for adaptive computer technologies at my institution *meets the needs of students with disabilities*
    b. ___ *It would make my job easier* if there was more physical space for adaptive computer technologies

13. a. ___ The training provided by my institution on adaptive computer technologies for students with disabilities *meets their needs*
    b. ___ *It would make my job easier* if there was a person at my institution whose responsibility would be to provide training to students with disabilities in how to use computer and/or adaptive computer technologies

Institutional Factors

1 = strongly disagree
2 = moderately disagree
3 = slightly disagree
4 = slightly agree
5 = moderately agree
6 = strongly agree

14. a. ___ The funding for my institution's computer and/or adaptive computer technologies (from my institution, government, programs, agencies, foundations, companies) *meets the needs of students with disabilities*
    b. ___ *It would make my job easier* if I (my office/service) received more financial support for computer and/or adaptive computer technologies

15. a. ___ The availability of adaptive computer technologies in mainstream computer labs at my institution *meets the needs of students with disabilities*
    b. ___ *It would make my job easier* if adaptive computer technologies were available in more computer labs on campus

16. a. ___ The accessibility of computer-based teaching materials used by professors (e.g., math software, CD-ROMs, web pages) *meets the needs of students with disabilities*
    b. ___ *It would make my job easier* if faculty were to make their computer-based teaching materials accessible to students with disabilities

17. a. ___ I am (my office/service is) consulted when major campus-wide computer infrastructure decisions are made (e.g., purchasing institution-wide software, web design, adding or improving computer labs)
    b. ___ *It would make my job easier* if I (my office/service) were consulted when major campus-wide computer infrastructure decisions are made

18. a. ___ There are opportunities for employees of my institution to learn about adaptive computer technologies
    b. ___ *It would make my job easier* if I (someone from my office/service) had professional development time to learn about adaptive computer technologies

19. a. ___ My institution has an advisory/steering committee which deals with the accessibility of computer technologies for students with disabilities
    b. ___ *It would make my job easier* if my institution were to have a multidisciplinary advisory/steering committee to deal with the accessibility of computer technologies
    c. ___ **If your rating for item "a" is between 4 and 6:** Does your committee have the following members?
        i. ____ Students with disabilities (Yes/No)
        ii. ____ Students without disabilities (Yes/No)
        iii. ____ You or someone from your office/service (Yes/No)
        iv. ____ Faculty (Yes/No)
        v. ____ Computer services staff (Yes/No)
        vi. ____ Administrators (Yes/No)
        vii. ____ Other (Yes/No) Specify _____

20. a. ___ The administration reacts positively when I approach them with problems related to the accessibility of computers on campus for students with disabilities
    b. ___ *It would make my job easier* if administration were to react more positively when I approach them with problems related to computers on campus for students with disabilities

21. a. ___ Personnel who take care of mainstream computers on campus have the expertise to deal with adaptive computer technologies
    b. ___ *It would make my job easier* if those who provide technical support for mainstream computers on campus would take responsibility for trouble-shooting adaptive computer technologies

22. a. ___ There is a person at my institution who has expertise in adaptive computer technologies (i.e., someone who is knowledgeable, keeps up-to-date with new products, and fixes hardware and software problems)
    b. ___ *It would make my job easier* if there was a person at my institution who had expertise in adaptive computer technologies

23. ____ The accessibility of the library's computers (e.g., computerized catalogues, data bases, CD-ROMs) *meets the needs of students with disabilities*

24. ____ Accessibility issues are covered when faculty are trained in how to use computer technologies in their courses

25. ____ The accessibility of my institution's internet-based distance education courses *meets the needs of students with disabilities*

Personal Perspectives

1 = strongly disagree
2 = moderately disagree
3 = slightly disagree
4 = slightly agree
5 = moderately agree
6 = strongly agree

26. ____ *It would make my job easier* if students with disabilities were knowledgeable users of computer and/or adaptive computer technologies

27. ____ *It would make my job easier* if students had access to adequate computer and/or adaptive computer technologies off campus (e.g., laptops, their own adaptive hardware/software)

28. ____ I have the sense that rehabilitation centres, programs, agencies, or companies that supply computer and/or adaptive computer technologies to students with disabilities provide appropriate software/hardware

29. ____ I have the sense that students with disabilities have received adequate training in using computer and/or adaptive computer technologies from rehabilitation centres, programs, agencies, companies, etc.

30. ____ *It would make my job easier* if rehabilitation centres, programs, agencies, companies that provide students with computer and/or adaptive computer technologies were to work cooperatively with me (my office/service)

31. ____ *It would make my job easier* if students with disabilities were able to get subsidised computer technologies from rehabilitation centres, programs, agencies, companies for home use more easily

32. ____ I am knowledgeable about adaptive computer technologies (e.g., software that enlarges what is on the screen, adapted mouse)

33. ____ Among the various disability-related services that you (your office/service) offer, computer-related services are (choose one of the following options)

a. ____ a very high priority
b. ____ a high priority
c. ____ a low priority
d. ____ a very low priority

Demographic Information

In the following questions, I will ask about "your institution." If you are a coordinator/director who looks after the entire institution, please base your answers on the whole school. However, if you are a coordinator/director of a specific campus or area, base your responses on the campus or area that you are responsible for.

34. ____ Approximately how many students with all types of disabilities, documented or not, including learning disabilities, are enrolled at your institution?

35. ____ Approximately what is the total student enrolment at your institution? (This includes students with and without disabilities and refers to the same campus(es) as the previous question.)

36. ____ We are also interested in studying faculty, professionals and other employees at colleges and universities. To the best of your knowledge, how many employees with disabilities, including yourself if applicable, are there at your institution?

If at least 1:

a. ____ If they need computer-related services/accommodations, are you (your office/service) expected to provide these services to them? Yes/No

If "no" to item "a":

b. ____ If not you (your office/service), whom do you think does or is supposed to provide services if these are needed?_____

37. ____ How many years have you personally worked providing services to postsecondary students with disabilities?

38. ____ What other computer technology issues are important to you that I have not asked you about?

If you would like more information about CADSPPE (Canadian Association of Disability Service Providers in Postsecondary Education), this can be found on the world wide web at: http://www.cadsppe.cacuss.ca

French Consent Form

Collège Dawson
Projet Adaptech
3040, rue Sherbrooke Ouest
Montréal, QC, Canada
H3Z 1A4

(514) 931-8731
Printemps 2000

FORMULAIRE DE CONSENTEMENT ÉCLAIRÉ DE L'ÉCHELLE D'ACCESSIBILITÉ AUX TECHNOLOGIES INFORMATIQUES AU NIVEAU POSTSECONDAIRE

1. Le but de cette étude subventionnée est d'évaluer les technologies informatiques et/ou technologies informatiques adaptatives dans l'enseignement postsecondaire aux étudiants ayant des incapacités.

2. Je comprends que l'on me demande de participer à une entrevue téléphonique fixée à un moment qui me convient. Cette entrevue enquêtera sur les technologies informatiques courantes et adaptatives dans le contexte postsecondaire. Je comprends que tous les renseignements divulgués demeureront confidentiels et qu'ils ne seront utilisés qu'aux seules fins de la présente étude.

3. Je comprends que je suis libre de poser toutes questions concernant la méthodologie de cette étude, et ce à tout moment. Si pour une quelconque raison je ressens un malaise ou j'ai des interrogations quant à ma participation au projet, je suis conscient être libre d'en discuter avec les directrices du projet, madame Catherine Fichten (514-931-8731, poste 1546; courriel: md71@musica.mcgill.ca) et madame Maria Barile (514-931-8731, poste 3586; courriel: mdb2@musica.mcgill.ca). Je reconnais être libre de participer ou non et de pouvoir mettre fin à ma participation à tout moment de l'étude.

4. Je comprends que si les résultats de cette étude sont publiés, tous les renseignements divulgués resteront strictement confidentiels et ma vie privée sera entièrement protégée. Je comprends que les affirmations faites ne seront pas associées à moi personnellement, ni à mon établissement d'enseignement.

5. Je comprends qu'en répondant aux questions de l'entrevue, je consens à ce que les données fournies soient incluses à l'étude de l'utilité et l'utilisation des technologies informatiques dans l'enseignement postsecondaire aux étudiants ayant des incapacités.

French Interview Questions

ÉCHELLE D'ACCESSIBILITÉ AUX TECHNOLOGIES INFORMATIQUES AU NIVEAU POSTSECONDAIRE

Dans ce document le générique masculin est utilisé sans intention discriminatoire et uniquement dans le but d'alléger le texte.

Objectifs

L'objectif général de ce questionnaire est d'obtenir un aperçu global des expériences des individus qui fournissent des services aux étudiants ayant des incapacités inscrits à l'enseignement au niveau postsecondaire. Les objectifs spécifiques sont d'enquêter sur: (1) l'organisation dans l'établissement d'enseignement des accommodements liés aux technologies informatiques du campus pour les étudiants ayant des incapacités, (2) les facteurs institutionnels et externes qui aident ou entravent l'accès aux technologies informatiques et/ou technologies informatiques adaptatives des étudiants ayant des incapacités, et (3) ce qui peut être fait afin d'améliorer l'environnement de travail du personnel offrant des services liés aux accommodements informatiques des étudiants ayant des incapacités.

La différence qui distingue cette étude de notre recherche précédente est qu'elle se concentre sur les individus qui offrent des services aux étudiants ayant des incapacités au niveau postsecondaire. L'accent de notre travail antérieur était sur les besoins et les préoccupations des étudiants eux-mêmes.

Instructions

Lorsque nous discuterons des «services» que vous offrez ou de ceux de «votre service/bureau», je ne ferai allusion qu'aux services relatifs aux technologies informatiques, et non pas à tous les services offerts aux étudiants ayant des incapacités inscrits à votre établissement d'enseignement. De plus, si je parle de «technologies informatiques et/ou technologies informatiques adaptatives», nous faisons référence aux technologies liées à l'informatique seulement. Ceci n'inclut pas les systèmes FM, les magnétophones à vitesses variables ou les preneurs de notes. Nous définissons la technologie informatique adaptative en fonction de matériels informatiques adaptatifs (ex., une souris adaptée) ou des logiciels adaptatifs (ex., un logiciel d'agrandissement d'écran).

Lorsque j'utilise le terme «étudiant» sans qualificatif, je fais référence aux étudiants ayant des incapacités/besoins particuliers.

Certaines questions réfèrent «à votre établissement d'enseignement». Répondez en fonction de la totalité de l'établissement d'enseignement si vous en êtes le coordonnateur/directeur. Toutefois, si vous êtes un coordonnateur/directeur d'un campus ou secteur, votre réponse devra refléter la situation du campus ou du secteur dont vous êtes responsable.

Je vous interrogerai également sur les «laboratoires informatiques courants» ou sur les technologies informatiques «courantes». Dans de tels cas, nous faisons référence à ceux destinés à la population estudiantine en général, et non aux étudiants ayant des incapacités exclusivement.

Nous ne nous attendons pas à ce vous ayez des connaissances détaillées sur les technologies informatiques ou que vous ayez des réponses concrètes à toutes les questions. Lorsque des expressions telles que «approximativement» ou «j'ai l'impression que» surviennent, nous nous intéressons à avoir une perspective générale de la problématique et non pas des détails spécifiques.

Information générale

0. ____ Numéro du participant

1. ____ Nom de l'établissement et/ou pavillon/campus dont vous êtes responsable _____

2. ____ Ville et province_____

3. a. ____ Sur le campus, avez-vous des technologies informatiques ou des technologies informatiques adaptatives destinées aux étudiants ayant des incapacités? Oui/Non

   Si oui à la question «a» :

   b. ____ Est-ce qu'un programme provincial/régional de prêts fournit une partie des technologies informatiques et/ou technologies informatiques adaptatives à votre établissement d'enseignement? Oui/Non

Technologies informatiques

Dans la section qui suit, nous faisons référence à la réponse aux besoins liés aux technologies informatiques et/ou technologies informatiques adaptatives des étudiants ayant des incapacités. Bien que nous soyons conscients qu'il y ait différents moyens de le faire, ici nous ne nous intéressons pas à la réponse aux besoins par l'entremise d'accompagnateurs. Toutefois, nous voulons investiguer sur la façon avec laquelle les technologies elles-mêmes répondent aux besoins des étudiants. Par exemple, lorsque les étudiants ont besoin de lire des documents à l'ordinateur, nous nous intéressons à ce qu'ils puissent le faire indépendamment d'un accompagnateur.

Évaluez dans quelle mesure vous êtes d'accord avec les affirmations suivantes. Utilisez une échelle à 6 points où:

1 = fortement en désaccord
2 = assez en désaccord
3 = un peu en désaccord
4 = un peu d'accord
5 = assez d'accord
6 = fortement d'accord

Ne passez pas trop de temps sur les affirmations, mais donnez nous plutôt une réponse qui décrirait le mieux ce que vous ressentez. Si un item ne s'applique pas à vous, répondez par «ne s'applique pas».

4. ____ Globalement, dans mon établissement d'enseignement, les besoins relatifs aux technologies informatiques et/ou technologies informatiques adaptatives des étudiants ayant des incapacités sont adéquatement satisfaits

Si vous ne possédez pas de technologies informatiques et/ou technologies informatiques adaptatives pour les étudiants ayant des incapacités, allez au numéro 14.

Technologies informatiques adaptatives du campus

5. ___ **Si vous avez un programme provincial/régional de prêts des technologies informatiques et/ou technologies informatiques adaptatives:** Globalement, les ressources offertes pour mon établissement d'enseignement par le programme provincial/régional de prêts *répondent aux besoins des étudiants ayant des incapacités* (répondez par «ne s'applique pas» si vous n'avez pas un tel programme)

6. ____ Dans mon établissement d'enseignement, les technologies informatiques et/ou technologies informatiques adaptatives sont suffisamment à jour pour *répondre aux besoins des étudiants ayant des incapacités*

7. ____ Dans mon établissement d'enseignement, les heures d'accès aux technologies informatiques adaptatives *répondent aux besoins des étudiants ayant des incapacités*

8. ____ Le programme de mon établissement d'enseignement de prêts de technologies informatiques et/ou technologies informatiques adaptatives pour un usage hors campus *répond aux besoins des étudiants ayant des incapacités*

9. ____ Dans mon établissement d'enseignement, il y a suffisamment d'ordinateurs ayant des équipements permettant l'accès à l'internet par l'entremise de matériels/logiciels adaptatifs *pour répondre aux besoins des étudiants ayant des incapacités*

10. ____ Dans mon établissement d'enseignement, le soutien technique offert aux étudiants qui utilisent les technologies informatiques adaptatives *répond aux besoins des étudiants ayant des incapacités*

11. a. ____ La disponibilité des technologies informatiques adaptatives des laboratoires/centres spécialisés réservés aux étudiants ayant des incapacités de mon établissement d'enseignement *répond à leur besoins*
    b. ____ *Ma tâche serait plus facile* s'il y avait plus de technologies informatiques adaptatives disponibles dans les laboratoires/centres spécialisés de mon établissement d'enseignement

12. a.____ Dans mon établissement d'enseignement, l'espace disponible pour les technologies informatiques adaptatives *répond aux besoins des étudiants ayant des incapacités*
    b.____ *Ma tâche serait plus facile* s'il y avait plus d'espace pour les technologies informatiques adaptatives

13. a. ____ Les formations offertes par mon établissement d'enseignement en ce qui a trait aux technologies informatiques adaptatives pour les étudiants ayant des incapacités *répondent à leurs besoins*
    b. ____ *Ma tâche serait plus facile* s'il y avait une personne de mon établissement d'enseignement qui aurait la responsabilité d'offrir de la formation aux étudiants ayant des incapacités sur l'utilisation des technologies informatiques et/ou technologies informatiques adaptatives

Facteurs institutionnels

1 = fortement en désaccord
2 = assez en désaccord
3 = un peu en désaccord
4 = un peu d'accord
5 = assez d'accord
6 = fortement d'accord

14. a. ____ Le financement des technologies informatiques et/ou technologies informatiques adaptatives pour mon établissement d'enseignement (de mon établissement d'enseignement, de programmes, d'agences, de fondations, de compagnies) *répond aux besoins des étudiants ayant des incapacités*
    b. ____ *Ma tâche serait plus facile* si je recevais (mon service/bureau recevait) plus de soutien financier pour les technologies informatiques et/ou technologies informatiques adaptatives

15. a. ____ La disponibilité des technologies informatiques adaptatives dans les laboratoires informatiques courants de mon établissement d'enseignement *répond aux besoins des étudiants ayant des incapacités*
    b. ____ *Ma tâche serait plus facile* si les technologies informatiques adaptatives étaient disponibles dans un plus grand nombre de laboratoires informatiques sur le campus

1 = fortement en désaccord
2 = assez en désaccord
3 = un peu en désaccord
4 = un peu d'accord
5 = assez d'accord
6 = fortement d'accord

16. a. ____ L'accessibilité du matériel de cours informatisé utilisé par les enseignants (ex., logiciels de mathématiques, cédéroms, pages web) *répond aux besoins des étudiants ayant des incapacités*
    b. ____ *Ma tâche serait plus facile* si le corps professoral rendait leurs matériels de cours informatisés accessibles aux étudiants ayant des incapacités

17. a. ____ Je suis (mon service/bureau est) consulté lors de décisions importantes concernant les parcs informatiques (ex., achat de logiciels pour l'ensemble de l'établissement d'enseignement, design de pages web, ajout ou amélioration des laboratoires informatiques)
    b. ____ *Ma tâche serait plus facile* si j'étais (mon service/bureau était) consulté lorsque des décisions majeures doivent être prises au sujet des parcs informatiques de tout le campus

18. a. ____ Il y a des occasions pour les employés de mon établissement d'enseignement d'acquérir des connaissances sur les technologies informatiques adaptatives
    b. ____ *Ma tâche serait plus facile* si j'avais (quelqu'un de mon service/bureau avait) du temps alloué au perfectionnement quant aux technologies informatiques adaptatives

19. a. ____ Mon établissement d'enseignement a un comité aviseur/consultatif qui s'occupe de l'accessibilité des technologies informatiques destinées aux étudiants ayant des incapacités
    b. ____ *Ma tâche serait plus facile* s'il y avait, dans mon établissement d'enseignement, un comité aviseur/consultatif multidisciplinaire qui s'occuperait de l'accessibilité des technologies
    c. ____ **Si votre évaluation pour la question «a» est entre 4 et 6:** Est-ce que le comité inclut les membres suivants?
        i. ____ Étudiants ayant des incapacités (Oui/Non)
        ii. ____ Étudiants n'ayant pas d'incapacités (Oui/Non)
        iii. ____ Vous ou une personne de votre service/bureau (Oui/Non)
        iv. ____ Corps professoral (Oui/Non)
        v. ____ Personnel du service informatique (Oui/Non)
        vi. ____ Cadres supérieurs (Oui/Non)
        vii. ____ Autre (Oui/Non) Spécifiez _____

20. a. ____ Les cadres supérieurs réagissent positivement lorsque je les approche avec des problèmes relatifs à l'accessibilité des ordinateurs du campus destinés aux étudiants ayant des incapacités
    b. ____ *Ma tâche serait plus facile* si les cadres supérieurs réagissaient plus positivement lorsque je les approche avec des problèmes relatifs aux technologies informatiques du campus qui sont destinées aux étudiants ayant des incapacités

21. a. ____ Le personnel qui s'occupe des technologies informatiques courantes sur le campus a l'expertise pour prendre soin des technologies informatiques adaptatives
    b. ____ *Ma tâche serait plus facile* si ceux qui s'occupent des technologies informatiques courantes sur le campus prenaient la responsabilité de remédier aux problèmes des technologies informatiques adaptatives

22. a. ____ Il y a une personne à mon établissement d'enseignement qui a l'expertise en matière de technologies informatiques adaptatives (c'est-à-dire, quelqu'un ayant des connaissances informatiques, qui est toujours au courant des nouveaux produits, qui est en mesure de régler les problèmes d'équipements matériels et de logiciels)
    b. ____ *Ma tâche serait plus facile* s'il y avait une personne de mon établissement qui aurait l'expertise en matière de technologies informatiques adaptatives

23. ____ L'accessibilité des ordinateurs des bibliothèques (ex., répertoires, bases de données informatisés, cédéroms) *répond aux besoins des étudiants ayant des incapacités*

24. ____ La question d'accessibilité est incluse dans la formation du corps professoral sur l'utilisation des technologies informatiques dans leurs cours

25. ____ L'accessibilité des cours d'éducation à distance par l'entremise d'Internet offert par mon établissement d'enseignement *répond aux besoins des étudiants ayant des incapacités*

Perspectives personnelles

1 = fortement en désaccord
2 = assez en désaccord
3 = un peu en désaccord
4 = un peu d'accord
5 = assez d'accord
6 = fortement d'accord

26. ____ *Ma tâche serait plus facile* si les étudiants ayant des incapacités étaient informés quant à l'usage des technologies informatiques et/ou technologies informatiques adaptatives

27. ____ *Ma tâche serait plus facile* si, hors campus, les étudiants avaient accès à des technologies informatiques et/ou technologies informatiques adaptatives adéquates (ex., ordinateurs portatifs, leur propre équipement matériel, logiciel adaptatif)

28. ____ J'ai l'impression que les centres de réadaptation, programmes, agences ou compagnies qui fournissent des technologies informatiques et/ou technologies informatiques adaptatives aux étudiants ayant des incapacités offrent des équipements matériels/logiciels adéquats

29. ____ J'ai l'impression que les étudiants ayant des incapacités ont reçu la formation adéquate pour utiliser les technologies informatiques et/ou technologies informatiques adaptatives des centres de readaptation, programmes, agences, compagnies, etc.

30. ____ *Ma tâche serait plus facile* si les centres de réadaptation, programmes, agences, compagnies qui fournissent aux étudiants des technologies informatiques et/ou technologies informatiques adaptatives travaillaient en collaboration avec moi (mon service/bureau)

31. ____ *Ma tâche serait plus facile* si les étudiants pouvaient plus aisément recevoir des technologies informatiques subventionnées des centres de réadaptation, programmes, agences, compagnies, destinées à un usage à la maison

32. ____ J'ai des connaissances sur les technologies informatiques adaptatives (ex., logiciel d'agrandissement d'écran, souris adaptée)

33. ____ Parmi les divers services que vous dispensez (votre service/bureau dispense) aux étudiants ayant des incapacités, les services liés aux technologies informatiques sont (choisissez-en une parmi les réponses suivantes)

a. ____ une très forte priorité
b. ____ une forte priorité
c. ____ une faible priorité
d. ____ une très faible priorité

Information démographique

Dans les questions qui suivent, je ferai référence «à votre établissement d'enseignement». Répondez en fonction de la totalité de l'établissement d'enseignement si vous en êtes le coordonnateur/directeur. Toutefois, si vous êtes un coordonnateur/directeur d'un campus ou secteur, votre réponse devra refléter la situation du campus ou du secteur dont vous êtes responsable.

34. ____ Approximativement combien d'étudiants ayant diverses incapacités, documentées ou non, incluant les troubles d'apprentissage, sont inscrits à votre établissement d'enseignement?

35. ____ Approximativement, quel est le nombre total d'étudiants inscrits à votre établissement d'enseignement? (Ceci inclut les étudiants ayant et n'ayant pas d'incapacités et fait également référence au(x) même(s) campus que la question précédente.)

36. ____ Nous voulons également enquêter sur les membres du corps professoral, les professionnels et autres employés des collèges et des universités. À votre connaissance, combien y a-t-il d'employés à votre établissement d'enseignement qui ont des incapacités (en vous incluant, si cela s'applique à vous)?

Si au moins 1:

a. ____ S'ils ont besoin de services/accommodements liés aux technologies informatiques, compte-t-on sur vous (votre service/bureau) pour les leur offrir? Oui/Non

Si non pour la question «a» :

b. ____ Si ce n'est pas vous (votre service/bureau), qui pensez-vous le fait ou devrait le faire si besoin il y a?
_____

37. ____ Depuis combien d'années travaillez-vous personnellement dans l'offre des services aux étudiants ayant des incapacités au niveau postsecondaire?

38. ____ Quelles autres questions liées aux technologies informatiques vous apparaissent importantes, mais dont nous n'avons pas discuté avec vous?

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Si vous souhaitez davantage d'informations sur l'ACCSEHP (Association canadienne des conseillers en services aux étudiants handicapés au postsecondaire), vous les trouverez à l'adresse internet suivante: http://www.cadsppe.cacuss.ca